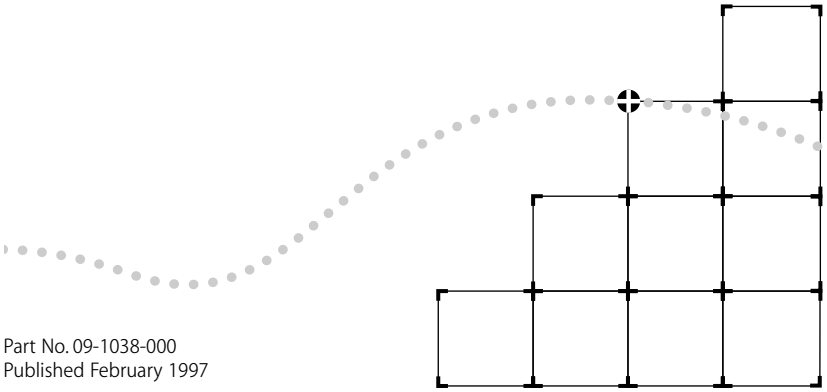
# ATMLink™ 155 PCI Network Interface Cards User Guide

**A member of the 3Com family of ATMLink network interface cards**



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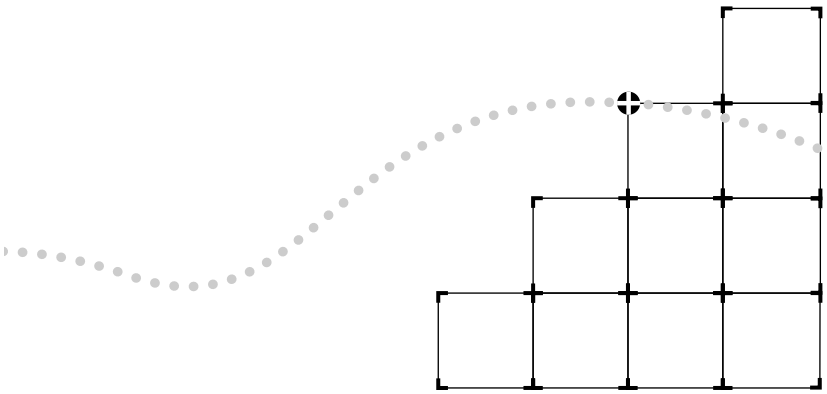

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# About This Guide

## Introduction

This user guide describes the installation and configuration of the 3Com® 3C975-F and 3C975-UTP ATMLink™ 155 PCI network Interface cards (NICs). The intended audience is the network administrator, network operator, or network hardware installer. Knowledge of Asynchronous Transfer Mode (ATM), Microsoft® Windows NT® and Novell® NetWare® server operations is required.

*If the information in the release notes shipped with your product differs from the information in this guide, follow the release notes.*

## How to Use This Guide

The following table shows where to find specific information in this guide.

| If you are looking for information on: | Turn to: |
|---|---|
| Hardware and software overview | Chapter 1 |
| Hardware installation | Chapter 2 |
| Microsoft Windows NT driver installation | Chapter 3 |
| Novell NetWare driver installation | Chapter 4 |
| ATMLink utility | Chapter 5 |
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## Conventions

Table 1 and Table 2 list text and icon conventions that are used throughout this guide:

**Table 1** Notice Icons

| Icon | Type | Description |
|---|---|---|
| | Information Note | Information notes call attention to important features or instructions. |
| | Caution | Cautions alert you to personal safety risk, system damage, or loss of data. |
| | Warning | Warnings alert you to the risk of severe personal injury. |

**Table 2** Text Conventions

| Convention | Description |
|---|---|
| "Enter" vs. "Type" | When the word "enter" is used in this guide, it means type something, then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says "type." |
| "Syntax" vs. "Command" | When the word "syntax" is used in this guide, it indicates that the general form of a command syntax is provided. You must evaluate the syntax and supply the appropriate port, path, value, address, or string; for example:<br>Enable RIPIP by using the following syntax:<br>`SETDefault !<port> -RIPIP CONTrol = Listen`<br>In this example, you must supply a port number for !<port>.<br>When the word "command" is used in this guide, it indicates that all variables in the command have been supplied and you can enter the command as shown in text; for example:<br>Remove the IP address by entering the following command:<br>**`SETDefault !0 -IP NETaddr = 0.0.0.0`**<br> <br>*For consistency and clarity, the full form syntax (upper- and lowercase letters) is provided. However, you can enter the abbreviated form of a command by typing only the uppercase portion and supplying the appropriate port, path, address, value, and so forth. You can enter the command in either upper- or lowercase letters at the prompt.* |

(continued)

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**Table 2** Text Conventions (continued)

| Convention | Description |
|---|---|
| Text represented as `screen display` | `This typeface` is used to represent displays that appear on your terminal screen, for example:<br>NetLogin: |
| Text represented as **`commands`** | **`This typeface`** is used to represent commands that you enter, for example:<br>**`SETDefault !0 -IP NETaddr = 0.0.0.0`** |
| Keys | When specific keys are referred to in the text, they are called out by their labels, such as "the Return key" or "the Escape key," or they may be shown as [Return] or [Esc].<br>If two or more keys are to be pressed simultaneously, the keys are linked with a plus sign (+), for example:<br>Press [Ctrl]+[Alt]+[Del]. |
| *Italics* | *Italics* are used to denote *new terms* or *emphasis*. |

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# 1 INTRODUCTION

This chapter describes the hardware and software features of the 3Com® 3C975 ATMLink™ 155 PCI network interface card (NIC), hereafter called the 3C975 ATMLink NIC.

## Product Features

The 3Com ATMLink 3C975 NIC is available in two models: the 3C975-F and the 3C975-UTP. The 3C975-F NIC has an SC duplex fiber-optic cable connector for double-strand 62.5/125 µm multimode fiber-optic cable. The 3C975-UTP NIC has an RJ-45 connector and requires Category 5 unshielded twisted-pair cable. Both 3C975 ATMLink NICs are high-performance single-slot, bus master, half-length PCI cards that provide 155.52 megabit per second (Mbps) SONET (STS-3c) physical layer support.

The 3C975 ATMLink NICs support the following features:

- ATM Forum standard LAN Emulation Client (LEC)
- ATM Forum AAL5 ATM adaptation layer
- ATM Forum UNI 3.0/3.1 standard signaling for switched virtual circuit (SVC) connections
- Up to 4 NICs per system
- Up to 16 emulated LANs (ELANs) per NIC
- Up to 512 active connections per NIC
- Up to 4,096 open and 1,024 simultaneously active virtual channel connections per system
- Resilient Server Link capability to protect against link failure
- Compliance with *PCI Local Bus Specification,* revision 2.0
- Link LED to indicate connection status

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- Traffic shaping (user-defined maximum peak rate per ELAN)
- Interim Local Management Interface (ILMI) 3.0 service
- User-selectable virtual path identifier/virtual circuit identifier (VPI/VCI) range
- Simple Network Management Protocol (SNMP) agent for NICs operating under the Windows NT® operating system

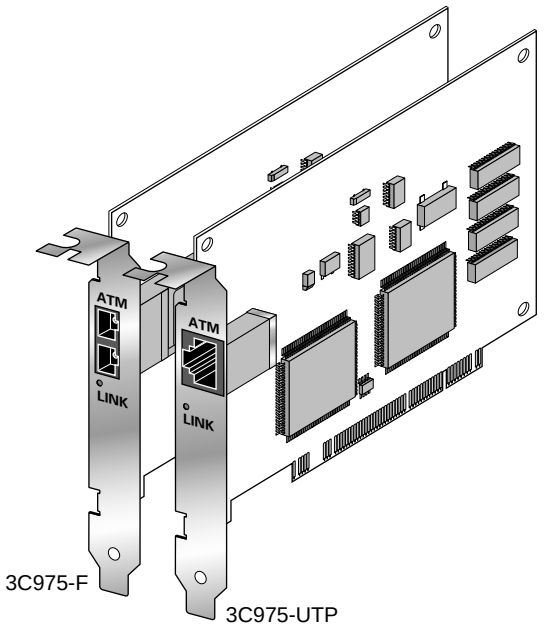


**Figure 1-1** 3C975-F and 3C975-UTP ATMLink NICs

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## Emulated LAN (ELAN) Overview

The 3Com ATMLink network driver conforms to the *ATM Forum LAN Emulation over ATM Specification 1.0* to interoperate with legacy LAN networks. LAN emulation supports the multicast, broadcast, and address resolution services characteristic of shared media LANs, within the connection-oriented ATM environment. Four devices are defined to provide these LAN emulation services:

- LAN Emulation Client (LEC) found on all end stations
- LAN Emulation Configuration Server (LECS)
- LAN Emulation Server (LES)
- Broadcast and Unknown Server (BUS)

The 3C975 ATMLink NIC network driver provides the LAN Emulation Client and supports up to 16 LECs per NIC. Each LEC configured on an ATMLink NIC is regarded by the network operating system as a separate (emulated) NIC and receives a unique MAC address. An "emulated" NIC connects to an emulated LAN (ELAN). In short, each physical ATMLink NIC can connect to up to 16 separate ELANs.

*The term ELAN is often used to denote an LEC in the 3Com ATMLink utilities, installation programs, and user guide.*

An ELAN is a logical grouping of end stations within an ATM network. The ATM network administrator creates ELANs when configuring the ATM switches. Membership in an ELAN is independent of the physical location of the end station within the ATM network. An end station can belong to multiple ELANs simultaneously. Mixed-media edge devices (such as the 3Com LinkSwitch® 2700 switch) that are connected to ATM switches enable ATM end stations to interoperate with legacy LAN end stations, because the legacy LAN end station and the ATM end station can be members of the same ELAN. This guide includes configuration procedures that allow an LEC to join an ELAN.

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For more detailed information on LAN emulation and emulated LANs, access the Networking Solutions Center on the 3Com World Wide Web site at www.3com.com. White papers on ATM are found in the Advanced Technology Solutions section.

## Software Descriptions

The following software is contained on the *ATMDisk*™ diskettes shipped with the 3C975 ATMLink NIC.

- Network driver for Microsoft® Windows NT, versions 3.51 and 4.0
- Network driver and NetWare® Loadable Modules (NLMs) for Novell® NetWare server, versions 4.x and 3.12
- ATMLink diagnostic utility (DOS version)
- ATMLink utility (Windows NT and NetWare versions)

Network drivers and utility programs are periodically updated and made available through 3Com online services. See Appendix B for details on how to use 3Com online services.

### Network Driver Description

3Com ATMLink network drivers support the following features:

- Simultaneous operation of up to four physical NICs per system
- ATM Forum LEC, version 1.0 for token ring and Ethernet LANs
- ATM Forum UNI 3.0 and 3.1 signaling
- 16 ELANs per NIC
- ILMI 3.0 services
- Resilient server links (RSL)
- Traffic shaping
- SNMP agent for NICs operating under Windows NT

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The NetWare 4.x and 3.12 drivers and Windows NT network drivers support up to four physical NICs per system.

Each physical NIC can be configured to support up to 16 LECs. Each LEC operates as a virtual NIC and has a unique MAC address.

*Only one LEC per NIC is supported in NetWare 3.12.*

The ATMLink NIC network driver uses switched virtual circuits (SVCs) to establish network connections with up to 4,096 open virtual channel connections (VCCs) supported per system. Each LEC requires a minimum of four VCCs in addition to those needed for its data requirements. These four VCCs are used by the LAN Emulation Server (LES) and the Broadcast and Unknown Server (BUS).

Resilient server links allow the network administrator to designate up to three of the installed 3C975 ATMLink NICs as standby NICs. In the event of link failure, the standby NIC assumes the configuration profile and network traffic of a failed active ATMLink NIC. Resilient server links are discussed in Chapter 3 and Chapter 4.

The ATMLink network drivers let the ATM network administrator set a maximum peak cell rate value for each LEC. This form of bandwidth allocation is useful in mitigating congestion and ensuring optimum usage of bandwidth.

## Diagnostic Utility Description

The ATMLink diagnostic utility is a DOS program that tests the internal integrity of the 3C975 ATMLink NIC and its ability to send and receive packets. The diagnostic utility also identifies the MAC address, the PCI slot number, and manufacturer's information for each installed 3Com ATMLink NIC. It is recommended that you run the diagnostic utility after installing the ATMLink NIC and before installing the network drivers. For information on how to use the diagnostic utility, see Chapter 6, "Diagnostics and Troubleshooting."

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## ATMLink Utility Description

An ATMLink utility for Microsoft Windows NT and for Novell NetWare is shipped on the *ATMDisk* diskettes. Use the ATMLink utility to display configuration and operating status of all installed ATMLink NICs and ELANs, as well as to reset a NIC. Chapter 5 describes how to use the ATMLink utility.

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# 2 HARDWARE INSTALLATION

This chapter describes the procedure for installing the 3C975 ATMLink NIC in your PCI-bus computer system. Follow all applicable instructions included with your system documentation on PCI-bus installations.

## Installation Overview

Hardware installation consists of the following major steps:

- Unpacking the 3C975 ATMLink NIC
- Installing the 3C975 ATMLink NIC in an available PCI slot
- Connecting the appropriate cables

Please observe all special notes and precautions.

For technical specifications on the 3C975 ATMLink NIC, see Appendix A.

## Installing the 3C975 ATMLink NIC

To install the 3C975 ATMLink NIC in your computer, perform these steps.

*Keep the 3C975 ATMLink NIC in the protective antistatic bag until you are ready to install it. To prevent damage to the NIC due to electrostatic discharge, wear a grounding strap and handle the NIC by its edges only. If you do not have a grounding strap, touch the chassis or the power supply just before handling the NIC. Do not touch the components or any metal parts on the NIC, except for the backplate.*

1 **Unpack and inspect the 3C975 ATMLink NIC for damage.**

2 **Exit all open applications and user processes.**

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3 **Turn off the power to the computer system and any attached devices.**

4 **Unplug the power cables from the power supply.**

**WARNING:** *Your computer operates with voltages that can be lethal. Before you remove the computer cover, carefully review the steps in this procedure and observe all cautions and warnings to protect yourself and to prevent damage to the computer.*

5 **Remove the cover from your computer.**

6 **Locate an empty bus master PCI-bus expansion slot.**

7 **Remove the metal expansion slot cover from the computer chassis, as shown in Figure 2-1.**

Save the screw for step 11 later in this section.

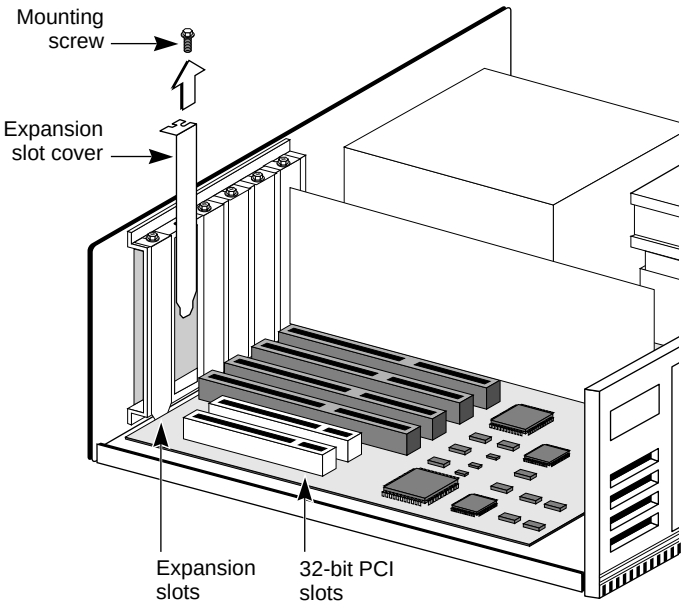


**Figure 2-1** Removing the Expansion Slot Cover

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**8 Insert the 3C975 ATMLink NIC in the selected slot, as shown in Figure 2-2.**

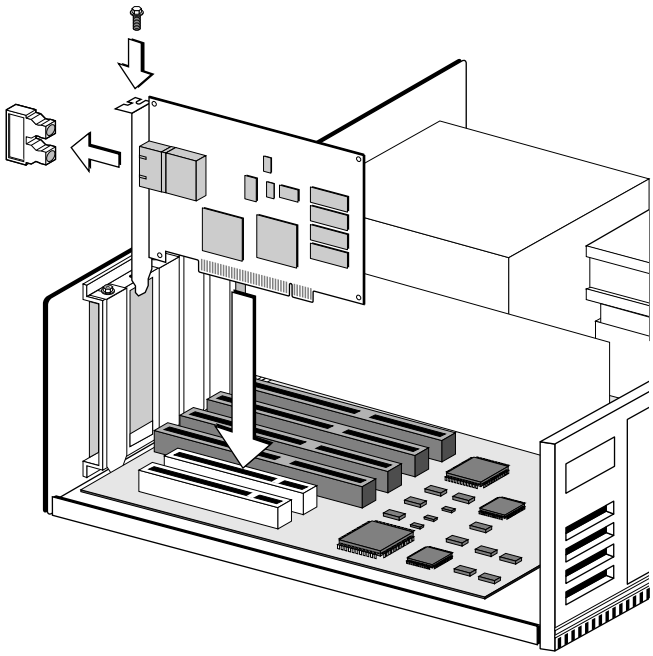

**Figure 2-2** 3C975-F ATMLink NIC Installed in the Chassis

**9 Write down the MAC address of the NIC and note which slot you used.**

This information is helpful when installing the network drivers and connecting the cables to the ATM switch.

*The MAC address is the 12-digit hexadecimal number printed on the small bar code label on the component side of the NIC.*

**10 Press down gently and firmly on the NIC to seat it properly.**

**11 Use the screw removed in step 7 to secure the 3C975 ATMLink NIC bracket to the system chassis.**

**12 Replace the system cover.**

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**13 Connect the power cables and turn on the power to the computer.**

**14 Connect the 3C975 ATMLink NIC to the network.**

The 3C975-F NIC uses 62.5/125 µm multimode fiber-optic cable with SC duplex connectors. The 3C975-UTP NIC uses Category 5 unshielded twisted-pair cable with an RJ-45 connector. Both models are shown in Figure 2-3.

The physical installation of the ATMLink NIC is now complete.

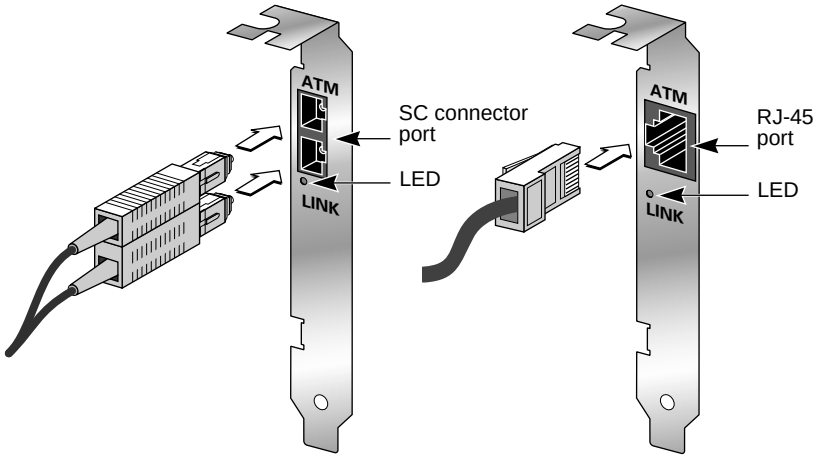


**Figure 2-3** SC Duplex and RJ-45 Connectors

*It is strongly recommended that you run the ATMLink diagnostic utility before attempting to install the network drivers. The diagnostic utility verifies that the on-board components of each NIC function correctly. This utility also correlates the MAC address of the NIC with its PCI slot number. You must know the PCI slot number to load, configure, or reconfigure the Microsoft Windows NT network drivers.*

The next step is to install the network software driver. For server driver installation procedures, refer to Chapter 3 for Windows NT, or to Chapter 4 for Novell NetWare.

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# 3 Windows NT Driver Installation

The 3C975 ATMLink NIC driver for file servers running Windows NT provides standards-based ATM LAN emulation connectivity to an ATM network. This permits legacy LAN networking technologies and protocols (such as Ethernet and token ring) to run over an ATM network.

This chapter includes procedures to install and remove the 3C975 ATMLink Windows NT network driver, as well as information about ELAN configuration and resilient links. A basic knowledge of Windows NT server operations and ATM concepts is required.

*The term ELAN is often used to denote an LEC in the graphical user interface and in the following procedures.*

## Driver Installation Overview

The Windows NT driver installation program consists of two parts:

- NIC detection, creation of resilient server links, and ELAN allocation
- NIC and ELAN configuration

During NIC detection the user designates each detected 3Com 3C975 ATMLink NIC as either an active or a standby NIC (see the section "Resilient Server Links Overview" later in this chapter) and specifies the number of ELANs supported by each active NIC. In the NIC/ELAN configuration portion of the driver installation, the user sets the ATM parameters for all active NICs and ELANs as well as configuration information for standby NICs.

*There can be up to four 3Com 3C975 ATMLink NICs installed in a single computer system, with each NIC supporting up to 16 ELANs.*

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## Driver Installation Requirements

Please confirm that the following requirements are met before you install and configure the 3Com ATMLink NIC Windows NT network driver.

### Hardware Requirements

- Computer with Intel®-based CPU and bus master PCI bus, running Microsoft Windows NT version 3.51 or 4.x
- 3.5-inch floppy disk drive
- At least one 3Com ATMLink NIC installed in the system

### Memory Requirements

Use the following formula to determine the Windows NT memory requirements in megabytes of RAM:

**(16 x Frame_Size) + [(No. of NICs –1) x (No. of ELANS)]**

where:

| | |
|---|---|
| Frame_size = 1 | When the maximum frame size is 1514 bytes |
| Frame_size = 2 | When the maximum frame size is 4542 bytes |
| Frame_size = 4 | When the maximum frame size is 9232 bytes |
| No. of NICs = | The number of ATMLink NICs installed in the computer |
| No. of ELANs = | The number of ELANs on the NIC with the most ELANs |

When NICs with different maximum frame sizes are installed in the same computer, use the larger Frame_Size value.

Round up the result to the first integral multiple of 8.

*Most Ethernet ELANs use a maximum frame size of 1514 bytes. Token ring ELANs typically use a maximum frame size of 4542 or 9232 bytes. See Table 3-1 for more information on the Maximum Frame Size configuration parameter.*

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### Memory Requirement Scenario 1

There are two NICs installed. One has a maximum frame size of 1514 bytes and four ELANs, and the other is a standby NIC. The memory requirement is 24 megabytes of RAM.

Frame_Size = 1 (1514 bytes maximum frame size)
No. of NICs = 2 (two NICs are installed in the computer)
No. of ELANs = 4 (only one NIC has ELANs configured)

$(16 \times 1) + [(2 - 1) \times (4)] = 20$
The closest integral multiple of 8 greater than 20 is 24.

### Memory Requirement Scenario 2

There are three NICs installed. One is a token ring LAN type with a maximum frame size of 4542 and four ELANs, one is a token ring LAN type with a maximum frame size of 9232 and two ELANs, and one is an Ethernet LAN type with a maximum frame size of 1514 and six ELANs. The memory requirement is 80 megabytes of RAM.

Frame_Size = 4 (use the largest value of all present)
No. of NICs = 3 (three NICs are installed in the computer)
No. of ELANs = 6 (the maximum number of ELANs on any one NIC)

$(16 \times 4) + [(3 - 1) \times (6)] = 76$
The closest integral multiple of 8 greater than 76 is 80.

## Software Requirements

- *ATMDisk* diskette for Windows NT

*3Com strongly recommends that your Windows NT operating system be updated with the most recent service packs available from Microsoft technical support (www.microsoft.com).*

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### NIC Information Requirements

- Names of the ELANs to be configured on each ATMLink NIC
- IP address and subnet mask of each ELAN using TCP/IP if a DHCP server is not being used
- ATM address of the LES or LECS (other than the ATM Forum Well-known Address) if ILMI services are not used
- PCI slot number of each installed ATMLink NIC

*The MAC address and PCI slot numbers of installed 3Com ATMLink NICs are used in the Windows NT driver installation. They can be obtained by using the diagnostic utility (see Chapter 6 for details).*

## Resilient Server Links Overview

Resilient server links add redundant function to your server to protect against network disruption and data loss.

To use resilient links, you must install two or more 3Com ATMLink NICs in your system. During the network driver configuration procedure, at least one NIC must be designated an active NIC. The standby NIC takes over when the link on a designated active NIC port is lost.

### Rules for Using Resilient Server Links

- Resilient server links are established only among ATMLink NICs installed in the same computer.
- To make a resilient server link, at least two ATMLink NICs must be installed in the same computer, and one of the NICs must be an active NIC.
- Active NICs and their standby NICs must be connected to switches on the same ATM network.
- Up to three standby NICs can be assigned to a single active NIC.
- A single standby NIC can be assigned to as many as three active NICs.

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- In a two-NIC scenario, when NIC 1 is active and NIC 2 is standby, and if the link on the NIC 1 port fails, NIC 2 assumes the configuration profile of NIC 1 and becomes the active NIC.

  NIC 1 now becomes a standby NIC for NIC 2.

- When a standby NIC assigned to multiple active NICs becomes active, it can no longer be a standby NIC for its other designated active NICs.
- When an active NIC with multiple standby NICs fails, the first eligible standby NIC (in driver load order) assumes the configuration profile of the active NIC. If this NIC in turn fails, the next designated standby NIC (in driver load order) takes over, and so on.
- A NIC cannot be configured as a standby NIC for another standby NIC.
- A resilient server link is established only if the active NIC is operational after Windows NT is booted.

  The standby NIC cannot assume the configuration profile of an active NIC that has never been operational.

## Driver Installation Summary for Experienced Users

Experienced Windows NT users knowledgeable in ATM configuration can use the following summary to install the 3C975 ATMLink network driver for Windows NT. Other users should proceed to the section "Installing the Network Driver" later in this chapter.

### Before You Begin

- Verify that all system and memory requirements are met.
- When multiple ATMLink NICs are installed, run the ATMLink diagnostic utility.

  Write down the MAC address, the bus number, and the slot number of each installed ATMLink NIC. See Chapter 6 for information on the ATMLink diagnostic utility.

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- Obtain the names of the ELANs you wish to join from your ATM system administrator.
- Obtain an IP address for each ELAN you intend to install, if the ELANs are to be used on an IP network without a DHCP server.

## Part One: NIC Detection, Resilient Server Links, and ELAN Allocation

1 **From the Network Settings window in the Control Panel, click *Add Adapter* and copy the 3C975 NIC driver from the 3Com *ATMDisk* diskette.**

The NIC Installation dialog box appears, identifying the first 3Com ATMLink NIC found on the PCI bus.

2 **Click *Yes* to install the ATMLink NIC network driver on the identified NIC, or click *No* to bypass the NIC.**

You may wish to bypass a previously installed NIC in the system.

The NIC Mode dialog box appears.

3 **Make the identified NIC an active or a standby NIC.**

- If you select *Stand-by*, the NIC Installation dialog box reappears when there are multiple NICs installed.
- If you select *Active*, the Total Number of ELANs dialog box appears.

4 **Enter the number of ELANs to be supported by the identified NIC.**

If more than one 3Com ATMLink NIC is installed, the installation program returns to step 2 and the NIC Installation dialog box.

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## Part Two: NIC and ELAN Configuration

After all the 3Com ATMLink NICs have been detected, the driver files copied, and the number of ELANs specified, the 3Com ATMLink Installation window appears.

1 **For each installed 3Com ATMLink NIC, set the following global NIC parameters (these are the same for all NICs in the system):**

- VPI/VCI Range
- Signaling Version

2 **For each installed 3Com ATMLink NIC, set the following local NIC parameters (these can vary with each NIC in the system):**

- LAN Type
- ILMI VPI/VCI
- Maximum Frame Size
- Resilient Server Links

*All of the above parameters except resilient link assignments must match the ATM switch settings. The default values work for most installations.*

3 **For each ELAN, set the following parameters:**

- ELAN Name
- Peak Rate
- LE Configuration Mode

4 **Click *Save & Exit* in the 3Com ATMLink Installation window.**

5 **Click *OK* in the Network Settings window.**

6 **Configure the IP parameters for each ELAN if IP is used.**

Enter dummy IP values for each standby NIC.

7 **Restart Microsoft Windows NT.**

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You have completed the ATMLink Windows NT network driver installation. The remaining sections of this chapter provide a more detailed approach to installing the ATMLink NIC network driver with Windows NT.

## Installing the Network Driver

The following driver installation procedure is standard to Windows NT 3.51. The driver can also be installed as part of the Custom setup procedure supplied with your Windows NT operating system. Refer to the *Microsoft Windows NT System Guide* for additional information.

### NIC Detection, Resilient Server Links, and ELAN Allocation

It is assumed that at least one 3C975 ATMLink NIC is installed in the system PCI bus.

1. **Boot your system under Windows NT.**
2. **Log into your Windows NT Administrator account.**
3. **Double-click the Control Panel icon.**
4. **Double-click the Network icon.**

   The Network Settings window shown in Figure 3-1 appears.

5. **Click *Add Adapter.***

   The Add Network Adapter window appears, as shown in Figure 3-2.

6. **Select *<Other>Requires disk from manufacturer* from the bottom of the Network Adapter Card list box.**
7. **Click *Continue.***

   The Insert Disk dialog box appears, as shown in Figure 3-3.

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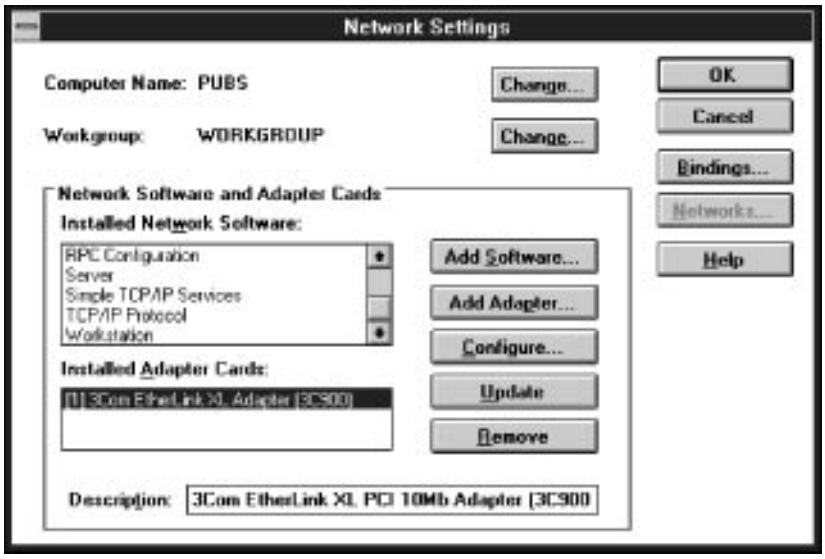


**Figure 3-1** Network Settings Window

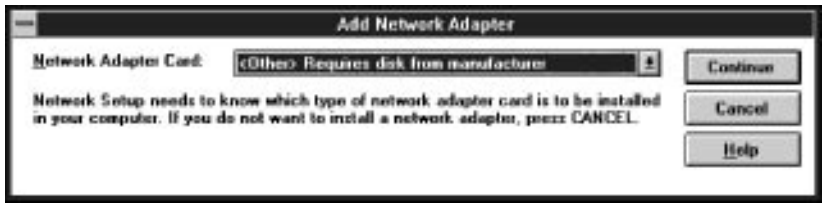
Add Network Adapter
Network Adapter Card:
<Other> Requires disk from manufacturer
Continue
Cancel
Help
Network Setup needs to know which type of network adapter card is to be installed in your computer. If you do not want to install a network adapter, press CANCEL.

**Figure 3-2** Add Network Adapter

Insert Disk
Insert disk with software provided by the software or hardware manufacturer. If the files can be found at a different location, for example on another drive type a new path to the files below.
OK
Cancel

**Figure 3-3** Insert Disk Dialog Box

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**8 Insert the *ATMDisk* diskette for Windows NT in a floppy disk drive.**

If necessary, change the drive designation to the appropriate floppy drive.

**9 Click *OK*.**

The Select OEM Option window appears, as shown in Figure 3-4.

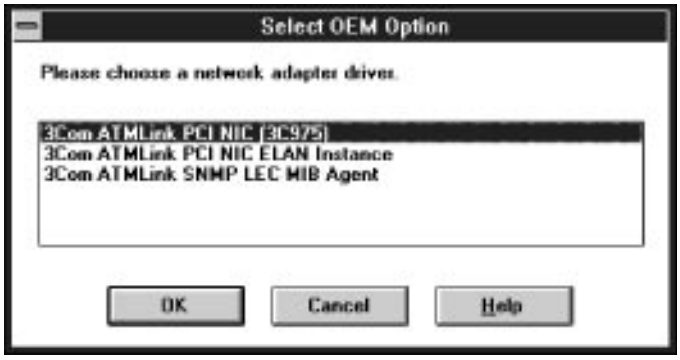


**Figure 3-4** Select OEM Option Window

**10 Select *3Com ATMLink PCI NIC (3C975)* and click *OK*.**

The installation program copies the network driver, ATM utility, ATM diagnostic utility, and SNMP agent files to the system hard disk and then detects all installed 3Com ATMLink NICs in the system. The dialog box shown in Figure 3-5 appears.

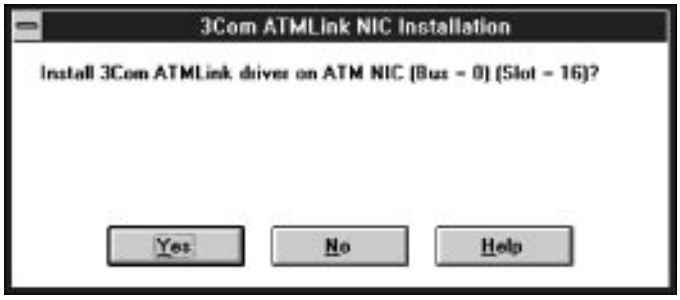


**Figure 3-5** NIC Installation Dialog Box

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**11 Click *Yes* if you want the 3Com driver installed on the indicated NIC. Otherwise, click *No*.**

If you click *Yes*, the NIC Mode dialog box appears, as shown in Figure 3-6. If you click *No*, the NIC Installation dialog box reappears for the next discovered ATMLink NIC.

*To correlate the PCI bus and slot number with a physical NIC, run the 3Com ATMLink diagnostic utility.*

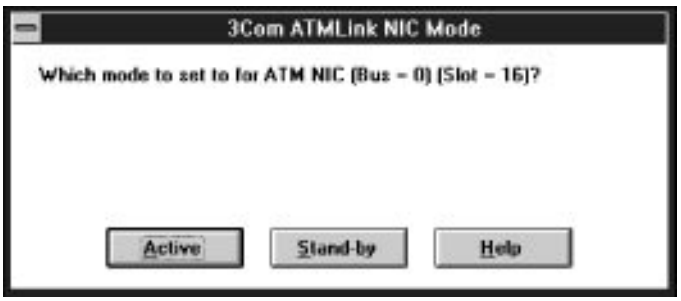


**Figure 3-6** NIC Mode Dialog Box

**12 Click *Active* to make the identified NIC an active NIC, or click *Stand-by* to make it a standby NIC (resilient server link).**

- If you select *Stand-by*, the NIC Installation dialog box reappears for the next discovered 3C975 ATMLink NIC.
- If you select *Active*, the Total Number of ELANs dialog box appears, as shown in Figure 3-7.

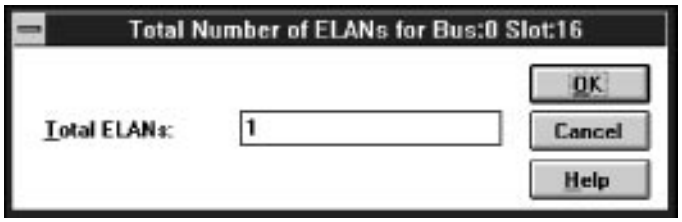


**Figure 3-7** Total Number of ELANs Dialog Box

**13 Enter the number of ELANs you require on the indicated NIC, and click *OK*.**

The maximum number of ELANs per NIC is 16.

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Each ELAN on a physical NIC is assigned a unique MAC address that is an increment of the base MAC address of the physical NIC.

When you have completed resilient server link and ELAN assignments for each discovered NIC, the 3Com ATMLink Installation window appears, as shown in Figure 3-8 in the next section.

## NIC and ELAN Configuration

The ELANs allocated to an active NIC appear in the ELAN portion of the ATMLink Installation window (Figure 3-8). The MAC addresses of the ELANs do not appear until the system is rebooted. The VCI/VPI Range and Signaling are global parameters set the same for all NICs in the system. LAN Type, ILMI VPI/VCI, and Maximum Frame Size are local NIC parameters and can be different for each NIC. Traffic Shaping and LE Configuration Mode, shown in Figure 3-9, are ELAN-specific parameters that can be different for each ELAN.

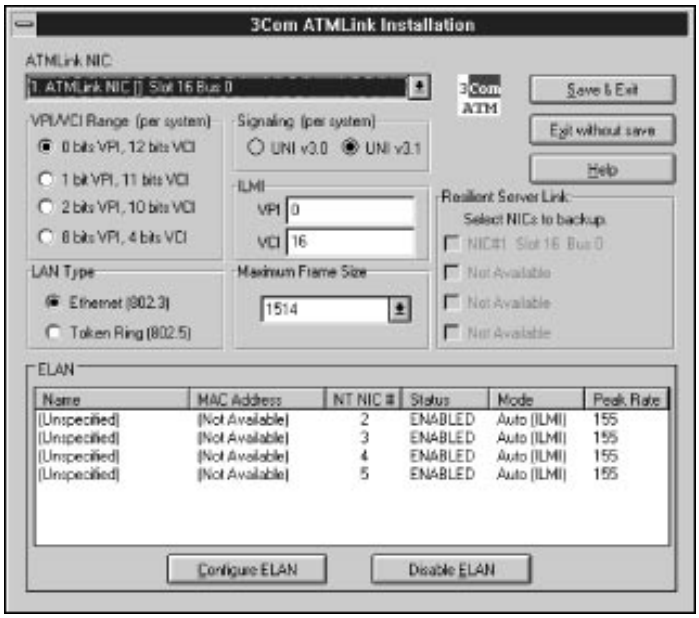


**Figure 3-8** 3Com ATMLink Installation Window

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Table 3-1 describes the fields and buttons in the ATMLink Installation and ELAN Configuration windows. Default values are shown in bold.

**Table 3-1** 3C975 ATMLink NIC Installation Configuration Parameters

| Field | Range of Values (Defaults in Bold) | Description |
|---|---|---|
| ATMLink NIC | All ATMLink NICs with installed drivers by PCI slot, bus number, and MAC address (after initial installation) | Select the NIC you wish to configure from the drop-down list. |
| ***Global NIC Parameters (must be the same for all NICs in a computer system)*** | | |
| VPI/VCI Range | **0 bits/12 bits**<br>1 bits/11 bits<br>2 bits/10 bits<br>8 bits/4 bits | This parameter is determined by the ATM switch setting. |
| Signaling | UNI v3.0<br>**UNI v3.1** | This parameter is determined by the ATM switch setting. |
| ***Local NIC Parameters (specific to each NIC in a computer system)*** | | |
| LAN Type | **Ethernet (802.3)**<br>Token Ring (802.5) | All ELANs configured on a NIC must be the same LAN type. |
| ILMI VPI | **0** | This parameter is determined by the ATM switch setting. |
| ILMI VCI | **16** | This parameter is determined by the ATM switch setting. |
| Maximum Frame Size | **1514**<br>4542<br>9232 | All ELANs on the same NIC have the same MFS value, also called maximum transfer unit (MTU). Use 1514 for Ethernet, 4542 for 4 Mbps token ring, and 9232 for 16 Mbps token ring. Only end stations using the same value can interoperate. |
| Resilient Server Link | Any active NIC | Select one or more eligible active NICs to make the current ATMLink NIC a standby NIC. |

(continued)

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**Table 3-1** 3C975 ATMLink NIC Installation Configuration Parameters (continued)

| Field | Range of Values (Defaults in Bold) | Description |
|---|---|---|
| ***ELAN Parameters (specific to each ELAN)*** | | |
| ELAN Name | 0- to 32-character ASCII string | ELAN names must match ELAN names configured on the ATM switch. ELAN names are case-sensitive. |
| Traffic Shaping | 1–**155** Mbps | Sets the maximum bandwidth available to an ELAN. |
| LE Configuration Mode | **Automatic using ILMI** | Select *Automatic using ILMI* for ILMI service. |
| | Automatic with specific LECS | Select *Automatic with specific LECS* to connect with a LECS different from that specified by ILMI. |
| | Manual with specific LES | Select *Manual with a specific LES* to bypass the LECS and connect directly with a LES of known address. |
| LECS ATM Address | **ATM Forum Well-known Address** | Enter the 20-byte network address of the target LECS if it does not use the ATM Forum Well-known Address. |
| LES ATM Address | No default | Enter the 20-byte network address of the target LES. |

To configure NICs and ELANs, follow these steps:

1 **Select the NIC that you want to configure from the ATMLink NIC list box in the ATMLink Installation window.**

You can configure the NICs in any order that you wish.

2 **To make the selected NIC a standby NIC, select one or more active NICs.**

Eligible active NICs appear in the Resilient Server Link box. If you make a NIC a standby NIC, no further configuration is necessary. Proceed to step 7.

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**3 Change the global NIC parameters if necessary.**

Global parameters values are the same for every NIC in the computer system.

**a** Select a VPI/VCI range.

Select the VPI/VCI range that matches the VPI/VCI range set on the ATM switch by the ATM network administrator. The default is 0 bits VPI, 12 bits VCI.

**b** Select a signaling option.

Select the option that matches the signaling option set on the ATM switch by the ATM network administrator. The default is UNI version 3.1.

**4 Change the local NIC parameters if necessary.**

Local parameter values are specific to the NIC being configured.

**a** Select a LAN type for the NIC.

All ELANs allocated to this NIC will be of this same LAN type. The default value is Ethernet.

**b** Set the maximum frame size (also known as the maximum transfer unit [MTU]). Select 1514 for Ethernet, 4542 for 4 Mbps token ring, or 9232 for 16 Mbps token ring. The same maximum frame size value should be used by all end stations on the same network.

**c** Edit the ILMI VPI/VCI parameters if necessary.

The ILMI VPI/VCI is set on the ATM switch. Most implementations of ILMI use the default value of VPI 0 and VCI 16.

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**5 Select an ELAN name and then click *Configure ELAN*.**

The ELAN Configuration window appears, as shown in Figure 3-9.

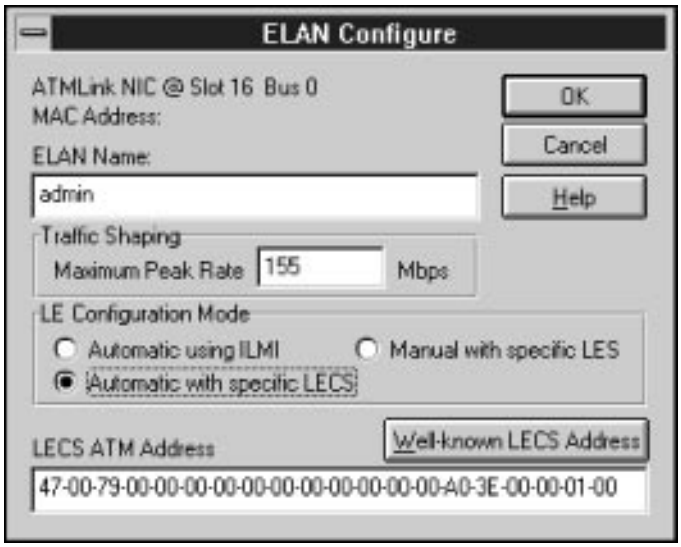


**Figure 3-9** ELAN Configuration Window

**a** Enter the ELAN name.

The ELAN names should match the ELAN names configured on the ATM switch, LECS, or LES. In many ATM installations the ELAN name is supplied by the LES.

**b** Select the LE configuration mode.

- Select *Automatic using ILMI* to use the ATM switch-based Interim Local Management Interface service (ILMI) to connect to the LES.
- Select *Automatic with specific LECS* if you wish to contact an LECS not identified by ILMI. Enter the 20-byte ATM address of the specific LECS if it does not use the default ATM Forum Well-known Address. To reinstate the default value, click the *Well-known LECS Address* button.
- Select *Manual with specific LES* to connect directly to the LES. Enter the 20-byte ATM address of the LES.

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**6 When all the clients are configured, click *OK*.**

The 3Com ATMLink Installation window shown in Figure 3-8 reappears.

*All entries and edits to the 3Com ATMLink Installation and ELAN Configuration windows are saved only when you select the* Save & Exit *button in the 3Com ATMLink Installation window. Clicking* Cancel *erases all entries and edits in both windows.*

**7 Click *Save & Exit* to exit the 3Com ATMLink Installation window.**

**8 Click *OK* in the Network Settings window.**

If IP services are installed, the TCP/IP Configuration dialog box appears, as shown in Figure 3-10. If any of the ELANs and standby NICs are on IP networks, proceed to the next step; otherwise, click *Cancel* in the TCP/IP Configuration dialog box and proceed to step 11.

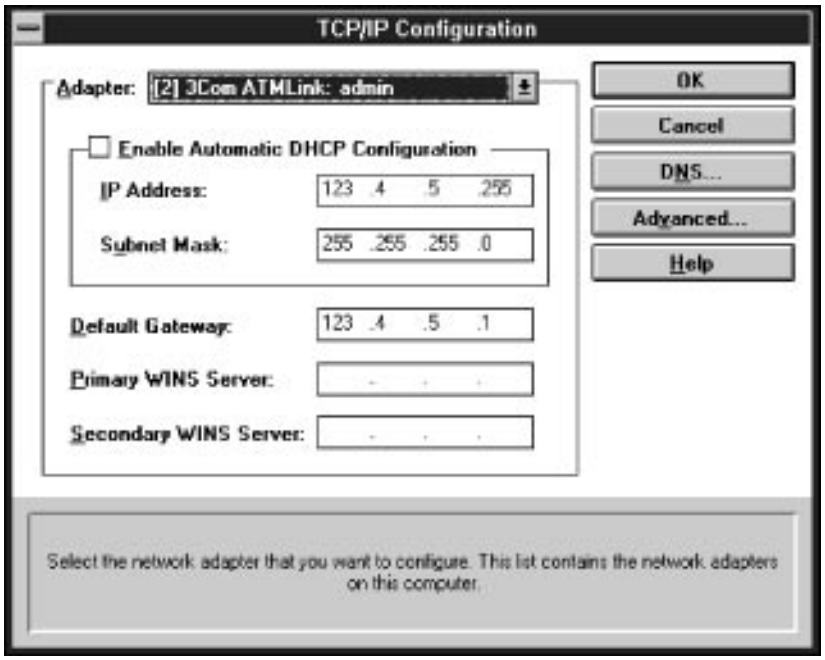


**Figure 3-10** TCP/IP Configuration Window with Sample Entries

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**9 Edit the TCP/IP parameters.**

All ELANs and standby NICs using TCP/IP require a unique IP address and subnet mask. Enter dummy values for the standby NICs.

*Contact your network administrator for appropriate IP addresses and subnet masks. Be sure that dummy IP addresses used for standby NICs do not conflict with other addresses on the network.*

Each ELAN must be on a different subnet. Refer to the *Microsoft Windows NT System Guide* for information on the other TCP/IP configuration values.

**a** Select an ELAN or standby NIC from the Adapter list box.

You can configure the ELANs and NICs in any order.

**b** Enter the IP address for an ELAN or a dummy address for a standby NIC.

**c** Enter the subnet mask.

**d** Enter the default gateway if applicable.

If your local network has a gateway to other networks, you must enter your network's gateway address to communicate with nodes on the other side of the gateway.

**e** Enter the primary WINS server if applicable.

This is the address of the primary name server used for looking up host names belonging to the local and connected networks.

**f** Enter the secondary WINS server if applicable.

If the primary name server does not respond to requests for host information, the secondary server will be queried.

**g** Repeat substeps *a* through *f* for each ELAN.

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**10 Click *OK* when the TCP/IP configuration is complete.**

The restart prompt shown in Figure 3-11 appears.

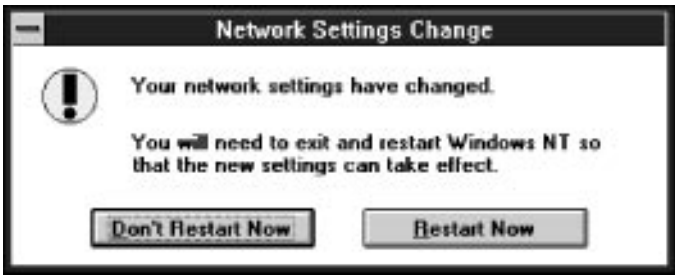
Network Settings Change
Your network settings have changed.
You will need to exit and restart Windows NT so that the new settings can take effect.
Don't Restart Now
Restart Now

**Figure 3-11** Restart Prompt for Adapter Driver

**11 Make sure that all cables are connected to the appropriate switch ports.**

**12 Select *Restart Now* to restart the Windows NT system.**

This completes the installation and configuration of the 3Com ATMLink Windows NT network driver.

## Verifying Driver Installation and Configuration

Perform the following procedures to verify that the driver is installed and operative:

- If you are using TCP/IP, ping the ATMLink end station that you want to test.
- Check the link LED.

  The LED is lit when the driver is loaded and a good connection is made to the ATM switch. The LED on a standby NIC does not light unless the NIC changes to active status.
- Launch the ATMLink utility and check the State parameter in the ELAN Information window. A functional ELAN is designated as OPERATIONAL.
- Check the Windows NT events log for any messages about the newly configured ELANs and NICs.

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## Enabling and Disabling ELANs

To disable an ELAN, click the ELAN name in the 3Com ATMLink Installation window (Figure 3-15), and then click *Disable ELAN*. This action disables the protocol bindings of the ELAN. The button name then changes to *Enable ELAN*.

To enable an ELAN, click the name of a disabled ELAN and then click *Enable ELAN*.

## Removing an ELAN

Individual ELANs are removed one at a time.

To remove an ELAN and its associated software drivers from Windows NT, follow these steps:

1 **Double-click the Control Panel icon in the Main group.**

The Control Panel window appears.

2 **Double-click the Network icon to access the Network Settings window.**

3 **Select an ELAN from the Installed Adapter Cards list.**

4 **Click *Remove*.**

You are prompted to confirm the removal of the component.

5 **Click *Yes* to remove the ELAN.**

The request is processed and the Networks Settings window reappears.

**CAUTION:** *Do not attempt to reinstall the ELAN before restarting the computer.*

6 **Click *OK* in the Network Settings window.**

The restart prompt appears.

7 **Select *Restart Now* to reboot the computer.**

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## Adding ELANs

Additional ELANs can be added to a NIC after the initial installation. Perform the following procedure to add additional ELANs:

1 **If multiple ATMLink NICs are installed, identify the PCI slot and bus number of the NICs on which you want to install additional ELANs.**

Use the diagnostic utility to obtain this information if you do not already have it.

2 **Perform steps 1 through 9 of the Windows NT driver installation procedure, as described in the section "Installing the Network Driver."**

3 **In the Select OEM Option window, select *3Com ATMLink PCI NIC ELAN Instance*, as shown in Figure 3-12.**

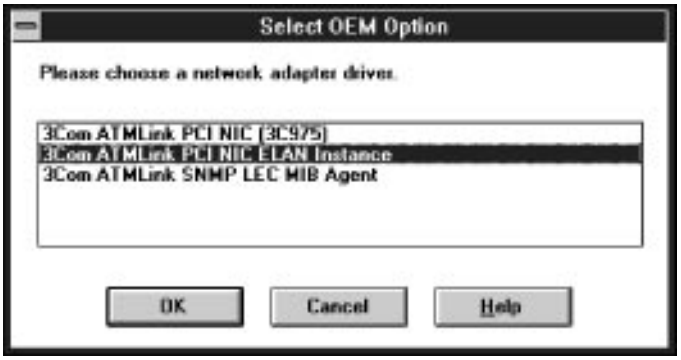


**Figure 3-12** Select OEM Option Window

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The installation program finds all installed 3Com ATMLink NICs. A dialog box appears for the first NIC discovered, as shown in Figure 3-13.

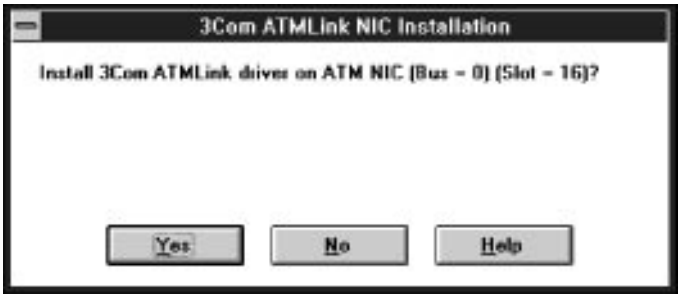


**Figure 3-13** NIC Installation Dialog Box

**4 If you want to add ELANs to the NIC identified in the dialog box, click *Yes*; otherwise, click *No*.**

When you click *No*, and if multiple NICs are installed, the NIC Installation dialog box reappears with the next detected NIC.

When you click *Yes,* the Total Number of ELANs dialog box appears, as shown in Figure 3-14.

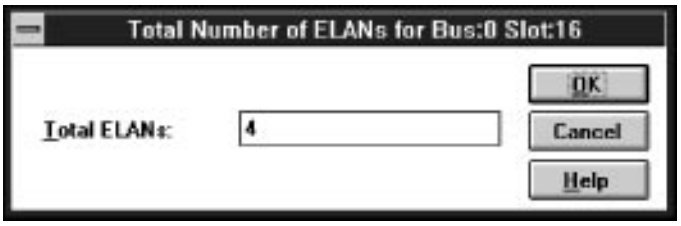


**Figure 3-14** Total Number of ELANs Dialog Box

**5 Enter the total number of ELANs you want to install on the indicated physical NIC and click *OK*.**

The total number of ELANs already configured on the indicated NIC is displayed in the Total ELANs field. To add ELANs to the NIC, enter a number that is the sum of the number of ELANs already configured and the number of ELANs you want to add. For example, if the NIC already has 4 ELANs and you want to add 1 more, enter 5 in the Total ELANs field.

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The preexisting ELANs retain all of their configuration information. The new ELANs appear in the ELAN portion of the 3Com ATMLink Installation window, as shown in Figure 3-15.

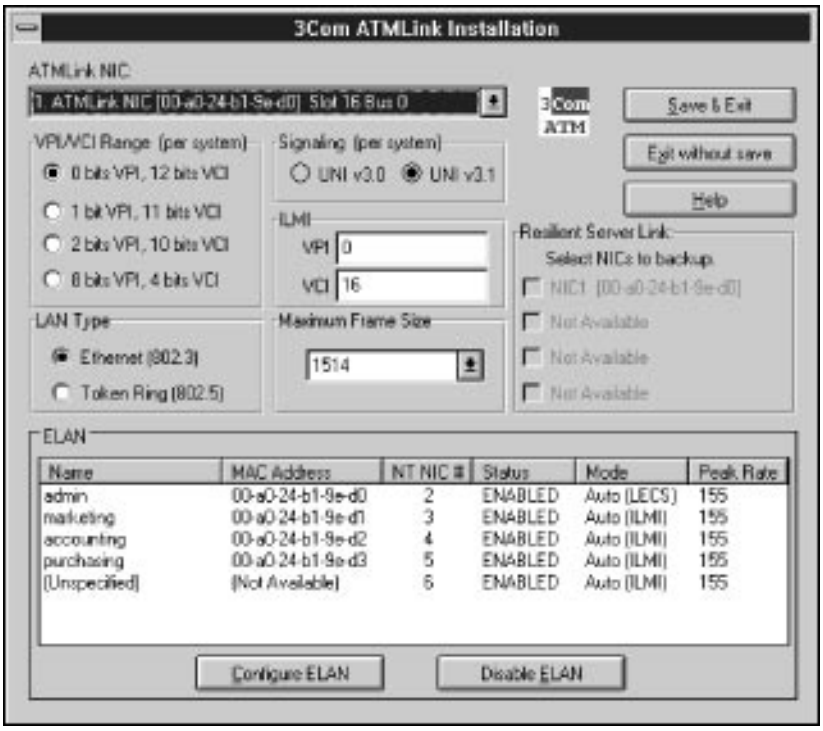
3Com ATMLink Installation
ATMLink NIC
1 ATMLink NIC [00-a0-24-b1-9e-d0] Slot 16 Bus 0
3Com ATM
Save & Exit
Exit without save
Help
VPI/VCI Range (per system)
0 bits VPI, 12 bits VCI
1 bit VPI, 11 bits VCI
2 bits VPI, 10 bits VCI
8 bits VPI, 4 bits VCI
Signaling (per system)
UNI v3.0
UNI v3.1
ILMI
VPI 0
VCI 16
Resilient Server Link
Select NICs to backup
NIC1 [00-a0-24-b1-9e-d0]
Not Available
Not Available
Not Available
LAN Type
Ethernet (802.3)
Token Ring (802.5)
Maximum Frame Size
1514
ELAN
Name | MAC Address | NT NIC # | Status | Mode | Peak Rate
admin | 00-a0-24-b1-9e-d0 | 2 | ENABLED | Auto (LECS) | 155
marketing | 00-a0-24-b1-9e-d1 | 3 | ENABLED | Auto (ILMI) | 155
accounting | 00-a0-24-b1-9e-d2 | 4 | ENABLED | Auto (ILMI) | 155
purchasing | 00-a0-24-b1-9e-d3 | 5 | ENABLED | Auto (ILMI) | 155
[Unspecified] | [Not Available] | 6 | ENABLED | Auto (ILMI) | 155
Configure ELAN
Disable ELAN

**Figure 3-15** 3Com ATMLink Installation Window Showing Additional ELANs

**6** **Configure the new ELANs, and then click *Save & Exit*.**

**7** **Click *OK* in the Networks Setting window.**

**8** **Configure IP information for the new ELANs if IP is used, and click *OK*; otherwise, click *Cancel*.**

**9** **Restart Windows NT.**

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## Adding SNMP Support

The SNMP agent shipped with the ATMLink NIC offers limited support for the *ATM Forum LAN Emulation Client Management Version 1.0 Specification*. The agent is shipped on the *ATMDisk* diskette as the LECMIB.DLL and LECIFMIB.DLL files, for use with Windows NT only. The files are automatically copied to the system hard drive during driver installation and install themselves if Windows NT is running the SNMP service. If the SNMP service was not running when the agent was copied from the *ATMDisk* diskette, the agent must be manually installed.

The ATMLink SNMP agent responds to requests from any standard SNMP network management software. The SNMP *Get* and *GetNext* commands work for all the LEC MIB objects. The *Set* command does not work with all SNMP variables, and the user cannot create or modify an LEC.

To manually install the ATMLink SNMP agent on your Windows NT system, perform the following procedure:

*Make sure that the SNMP service is installed on Windows NT. See your* Microsoft WIndows NT Installation Guide *for more information.*

1 **Perform steps 1 through 9 of the Windows NT driver installation procedure described in the section "Installing the Network Driver."**

2 **From the Select OEM Option dialog box, select *3Com ATMLink SNMP LEC MIB Agent*, as shown in Figure 3-16.**

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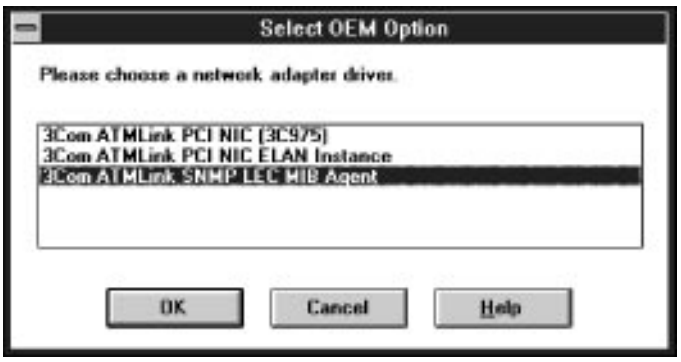


**Figure 3-16** Selecting the SNMP LEC MIB Agent

**3** Click *OK*.

The SNMP agent files are copied to the system hard disk.

**4** Click *OK* in the Network Settings window.

**5** Restart Windows NT.

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# 4 NetWare Server Driver Installation

The 3C975 ATMLink NIC driver for file servers running Novell NetWare 3.12 and 4.x provides standards-based ATM LAN emulation connectivity to an ATM network. This permits legacy LAN networking technologies and protocols (such as Ethernet and token ring) to run over an ATM network.

This chapter includes procedures to install and remove the 3C975 ATMLink Novell NetWare network driver, as well as information about LEC configuration and resilient server links. A knowledge of Novell NetWare and ATM is required.

*If the information in the release notes shipped with your product or the README.TXT files on the* ATMDisk *diskette differs from the information in this guide, follow the release notes or README.TXT files.*

## Driver Installation Overview

Installation of the 3Com ATMLink NIC NetWare driver is divided into three parts:

- Confirming that the driver installation requirements have been met
- Copying the driver to the hard drive of the server manually or by using the NetWare install utility
- Configuring the LEC parameters by editing the AUTOEXEC.NCF file or using the NetWare install utility

The installation requirements specify the hardware and software required for installation of the network driver. Required software includes NetWare Loadable Modules (NLMs) that permit NetWare versions 3.12 and 4.x to function with the 3Com ATMLink NIC network drivers.

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Copying the driver from the *ATMDisk* diskette to the hard drive of the server is a standard NetWare driver installation operation, performed manually or by using the standard NetWare install utility. This guide documents the use of the NetWare install utility.

After the ATMLink NIC network driver (3C975.LAN) has been copied to the server system directory, the driver is modified with the NetWare install utility to configure the parameters of the first LEC. During this process the NIC can also be configured for resilient server links. When all the LEC parameters or resilient link parameters have been set, the installation program saves the parameters, loads the driver, and modifies the AUTOEXEC.NCF file by adding appropriate *load* and *bind* command lines.

To configure additional LECs, you must modify the same 3C975.LAN driver. Resilient server links and LECs can be configured manually by editing the AUTOEXEC.NCF file. Procedures for manually editing the AUTOEXEC.NCF file and for unloading network drivers are included at the end of this chapter.

*NetWare 4.x supports up to 4 3C975 ATMLink NICs per system, with up to 16 LECs per NIC. NetWare 3.12 supports up to four NICs per system and one LEC per NIC.*

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## Driver Installation Requirements

Please confirm that the following installation requirements are met before installing and configuring the network driver.

### Hardware Requirements

- File server with a PCI bus running Novell NetWare version 3.12 or 4.x
- 3.5-inch floppy disk drive
- At least one 3Com ATMLink NIC installed in the system

### Memory Requirements

- 64 MB of system memory recommended for each installed ATMLink NIC

### Software Requirements

- 3Com *ATMDisk* diskette for Novell NetWare

  Before installing the driver, review the README.TXT document included on the *ATMDisk* diskette.

*3Com strongly recommends that your Novell network operating system be updated with the most recent patches and updates available from Novell technical support (www.novell.com).*

### NIC Information Requirements

- The names of the ELANs to be configured on each ATMLink NIC
- IP address and subnet mask of each LEC using TCP/IP

*The MAC address and PCI slot numbers of installed 3Com ATMLink NICs are not used in the NetWare driver installation, but they can be obtained by using the diagnostic utility (see Chapter 6 for details).*

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## Resilient Server Links Overview

Resilient server links add redundant function to your server to protect against network disruption and data loss.

To use resilient links, you must install two or more 3Com ATMLink NICs in your system. During the network driver configuration procedure, at least one NIC must be designated as an active NIC, and one a standby. The standby NIC takes over when the link on a designated active NIC port is lost.

### Rules for Using Resilient Links

- Resilient server links are established only among ATMLink NICs installed in the same computer.
- To make a resilient server link, at least two ATMLink NICs must be installed in the same computer, and one of the NICs must be an active NIC.
- Active NICs and their standby NICs must be connected to switches on the same ATM network.
- Up to three standby NICs can be assigned to a single active NIC.
- A single standby NIC can be assigned to as many as three active NICs.
- In a two-NIC scenario, when NIC 1 is active and NIC 2 is standby, and if the link on the NIC 1 port fails, NIC 2 assumes the configuration profile of NIC 1 and becomes the active NIC.

  NIC 1 now becomes a standby NIC for NIC 2.
- When a standby NIC assigned to multiple active NICs becomes active, it can no longer be a standby NIC for its other designated active NICs.
- When an active NIC with multiple standby NICs fails, the first eligible standby NIC (in driver load order) assumes the configuration profile of the active NIC. If this NIC in turn fails, the next designated standby NIC (in driver load order) takes over, and so on.

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- A NIC cannot be configured as a standby NIC for another standby NIC.
- A resilient server link is established only if the active NIC is loaded before the standby NIC and is operational after NetWare is booted.

  The standby NIC cannot assume the configuration profile of an active NIC that has never been operational.

## Implementing Resilient Server Links in NetWare

In NetWare, an active NIC and all of its standby NICs must share the same interrupt request level (IRQ). Because the PCI bus often assigns different IRQs to devices found in the PCI slots, you may need to use the system CMOS setup utility to manually assign the same IRQ to the target NICs. To see the IRQ of an ATMLink NIC, access the NIC Information screen in the ATMLink utility (see Chapter 5).

A standby NIC must have these attributes:

- One or more designated active NICs
- The same link type as its active NICs
- Its own card number and channel number

The Home, Link Type, Card Number, and Channel Number parameters in the NetWare install utility are used to specify these attributes. The corresponding keywords are *home*, *linktype*, *channel*, and *cardnum*. See Table 4-1 and Table 4-2 later in this chapter for explanations of the NetWare install utility parameters and keywords.

To configure standby NICs manually in the AUTOEXEC.NCF file, use the appropriate keywords, as shown in the following example, where card 2 is a standby NIC for cards, 1, 3, and 4. Note that the active NICs must be loaded before the standby NICs.

```
load 3c975 cardnum=1, linktype=1 channel=1 (etc.)
load 3c975 cardnum=3, linktype=1 channel=2 (etc.)
load 3c975 cardnum=4, linktype=1 channel=3 (etc.)
load 3c975 cardnum=2 linktype=1 channel=4 home=1,3,4
```

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A NIC configured as a standby NIC does not require other keyword parameters or a *bind* command, because it assumes the configuration profile of the active NIC. For more information on editing the AUTOEXEC.NCF file, see the section "Editing the AUTOEXEC.NCF File" later in this chapter.

## Loading the Server Driver

*The following procedure describes the installation procedure for Novell NetWare 4.10. In NetWare version 3.12, LECs must be manually configured by editing the AUTOEXEC.NCF. In NetWare version 4.11, the install utility user interface differs slightly from that shown in this user guide.*

### Before You Begin

Perform the following operations before loading the ATMLink NetWare drivers:

- Load the NLMs provided by 3Com on the *ATMDisk* diskette:
  - NBI.NLM
  - MSM.NLM
  - ETHERTSM.NLM
  - TOKENTSM.NLM

*The NLMs for NetWare version 3.12 are also on the* ATMDisk *diskette. See the README.TXT file for further information.*

- Set the number of minimum packet receive buffers in the STARTUP.NCF file.

  Use the following syntax to set the number of minimum packet buffers required for the ATMLink NICs:

  ```
  Minimum Packet Receive Buffers=<# of buffers>
  ```

  where <# of buffers>= 64 * number of ATMLink NICs

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If the number of minimum packet receive buffers is already present in the STARTUP.NCF file, add that number to the number calculated for the ATMLink NICs.

## Driver Installation Procedure

Perform the following steps to install the 3Com 3C975 ATMLink NIC driver on a NetWare 4.x file server:

1 **With NetWare 4.x installed and the server up and running, enter the following command at the prompt:**

```
load install
```

The Installation Options screen appears, as shown in Figure 4-1.

NetWare Server Installation 4.1
NetWare Loadable Module
Installation Options
Driver options (load/unload disk and network drivers)
Disk options (configure/mirror/test disk partitions)
Volume options (configure/mount/dismount volumes)
License option (install the server license)
Copy files option (install NetWare system files)
Directory options (install NetWare Directory Services)
NCF files options (create/edit server startup files)
Product options (other optional installation items)
Server options (install/upgrade this server)
Exit
Use the arrow keys to highlight an option, then press <Enter>.

**Figure 4-1** Installation Options Screen

*Use the arrow keys to select an item in any of the NetWare dialog boxes and then press [Enter].*

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**2** Select *Driver options*.

The Driver Options screen appears, as shown in Figure 4-2.

**3** Select *Configure network drivers*.

The Additional Driver Actions screen appears, as shown in Figure 4-3.

**Figure 4-2** Driver Options Screen

**Figure 4-3** Additional Driver Actions Screen

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**4 Choose *Select a driver.***

The Select a Driver screen appears, as shown in Figure 4-4.

If this is the first installation of the 3C975 NIC driver, it will not appear in the above list.

**5 Press the [Insert] key to install a driver from the floppy disk drive.**

A system message for selecting a disk drive appears, as shown in Figure 4-5.

**Figure 4-4** Select a Driver Screen

NetWare Server Installation 4.1
NetWare Loadable Module
Path A:\ will be scanned for drivers to install. Verify that this directory path corresponds to where the driver file (*.LAM) is located. Drivers for a large number of network interface boards are included with NetWare. You may insert the appropriate NetWare diskette (or specify a NetWare CD-ROM directory), or insert a third-party diskette.
On the CD-ROM, disk drivers are located in directory \nw410\diskdrv and LAN drivers are in directory \nw410\landrv.
Press <F3> to specify a different path:
Press <F4> to specify a remote workstation path:
Press <Enter> to continue.
(To scroll, <F7>-up <F8>-down)
Continue <Enter>
Select a listed driver <Enter>
Install an unlisted driver <Ins>
Help <F1>
Continue without selecting <F10>

**Figure 4-5** Notes for Selecting a Drive Screen

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**6 Insert the *ATMDisk* diskette for NetWare in a floppy drive.**

If a path other than drive A: is required, press [F3] to specify a different drive.

**7 Press [Enter].**

The Select a Driver to Install screen appears, as shown in Figure 4-6.

**Figure 4-6** Select a Driver to Install Screen

**8 Press [Enter] to select the 3Com 3C975 ATMLink driver.**

**9 Select *Yes* when you are prompted to confirm the name of the driver to copy.**

The install utility copies the driver to the appropriate server subdirectory.

Proceed to the next section to configure LECs and resilient server links.

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## Configuring LECs and Resilient Server Links

After the driver files are copied to the server, the ELAN Configuration screen appears, as shown in Figure 4-7.

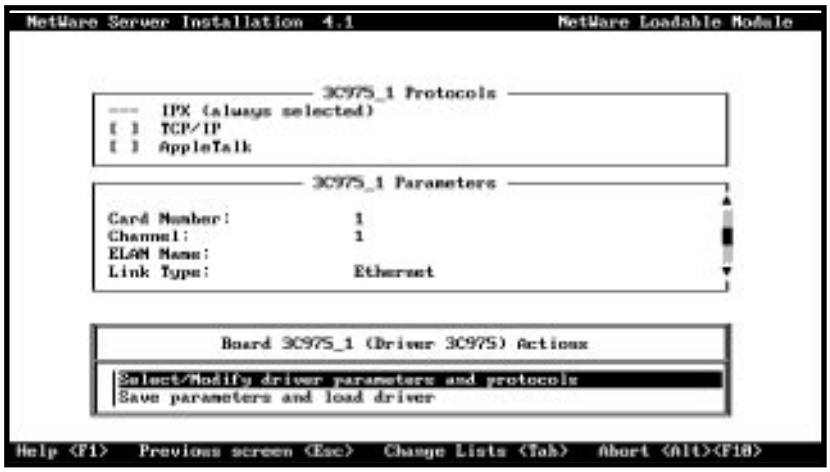


**Figure 4-7** ELAN Configuration Screen

Table 4-1 lists the configuration parameters of the 3Com ATMLink NIC, the range of values, and parameter descriptions. Default values are shown in bold.

**Table 4-1** 3C975 ATMLink NIC NetWare Install Utility Configuration Parameters

| Parameter | Range of Values (Defaults in Bold) | Description |
|---|---|---|
| Card Number | **1**, 2, 3, 4 | This number denotes which physical NIC is being configured. |
| Channel | **1**–64 | Use a unique channel number for each ELAN and standby NIC in the system (16 ELANs per NIC, 4 NICs per system). |
| ELAN Name | 1- to 32-character ASCII string | ELAN names should match ELAN names configured on the ATM switch. |
| Link Type | **Ethernet**<br>Token ring | All ELANs with the same card number must have the same link type. A standby NIC must have the same link type as its active NICs. |
| Home Card | **<blank>**, 1, 2, 3, 4 | If Card Number=3 and Home=2,1 then Card 3 is a standby NIC for Card 2 and Card 1. |

(continued)

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**Table 4-1** 3C975 ATMLink NIC NetWare Install Utility Configuration Parameters (cont'd)

| Parameter | Range of Values (Defaults in Bold) | Description |
|---|---|---|
| Maximum Frame Size | **1514**<br>4542<br>9232 | All ELANs with the same card number must have the same MFS value, also called maximum transfer unit (MTU). Use 1514 for Ethernet, 4542 for 4 Mbps token ring, and 9232 for 16 Mbps token ring. Only end stations using the same value can interoperate. |
| Rate | 1–**155** | Sets the maximum bandwidth in Mbps available to an LEC. |
| LEC Configuration Mode | **Automatic**<br>Manual | Select Automatic for ILMI service. Select Manual to connect with a specific LECS or LES. |
| LECS Network Prefix | **ATM Forum Well-known Address (not shown)** | Enter the 13-byte network prefix of the switch on which the target LECS resides. |
| LECS User Part | **00A03E00000100 (not shown)** | Enter the 7-byte user part of the target LECS address (the ESI plus 00 as the selector byte). |
| LES Network Prefix | No default | Enter the 13-byte network prefix of the switch on which the target LES resides. |
| LES User Part | No default | Enter the 7-byte user part of the target LES address (the ESI plus 00 as the selector byte). |
| Maximum VCCs Allowed | 5–**1024** | There are 4,096 open VCCs supported per system (4 NICs per system). |
| VPI/VCI Range | **0 bits/12** bits<br>1 bits/11 bits<br>2 bits/10 bits<br>8 bits/4 bits | This parameter is determined by the ATM switch setting and must be the same for all NICs in the system. |
| ILMI VPI | **0** | This parameter is determined by the ATM switch setting. |
| ILMI VCI | **16** | This parameter is determined by the ATM switch setting. |
| Signaling Version | UNI v3.0<br>**UNI v3.1** | This parameter is determined by the ATM switch setting and must be the same for all NICs in the system. |

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To configure LECs using the NetWare install program, perform the following procedure:

1 **Select *Select/Modify driver parameters and protocols* at the bottom of the ELAN Configuration screen, as shown in Figure 4-7.**

The highlight bar moves to the TCP/IP option in the Protocols box.

2 **To add a protocol, select the desired protocol from the Protocols box.**

IPX is the default protocol. If you select TCP/IP, the dialog box shown in Figure 4-8 appears.

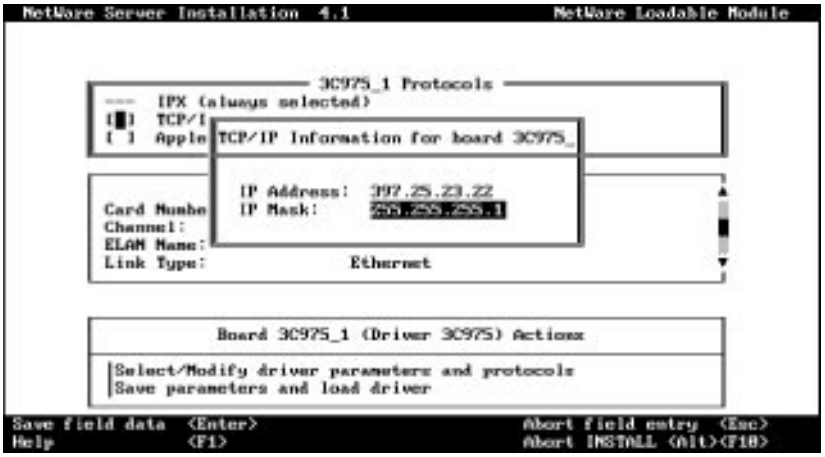


**Figure 4-8** Configuring the TCP/IP Network Interface

3 **Edit the TCP/IP information as follows:**

**a** Enter the IP address.

**b** Enter the IP mask.

**c** Press [Enter] to continue.

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**4 Press [F3] to set the frame type.**

Use the arrow keys to select a new frame type, if necessary.

The default frame type is 802.2. If you are configuring a token ring LEC, change the frame type to Token Ring or Token Ring SNAP as appropriate.

**5 Edit the Card Number parameter.**

**a** Use the arrow keys to select the Card Number parameter and press [Enter].

The dialog box shown in Figure 4-9 appears and lets you select the card number.

**b** Select the card number you want and press [Enter].

*When multiple ATMLink NICs are installed, you must determine which physical NIC corresponds to which card number in order to correctly connect the cables to the ATM switch. See the next section, "NetWare Card Numbers and Multiple Physical NICs."*

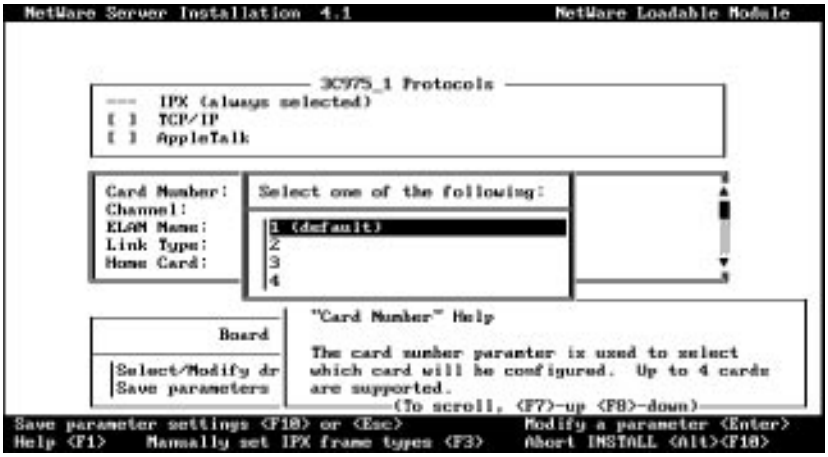


**Figure 4-9** Selecting the Card Number

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**6 Enter the ELAN name.**

In most cases, the ELAN name should match a preconfigured name on the ATM switch, such as the 3Com CELLplex™ 7000 switch. Other manufacturers may have different requirements. Refer to your ATM switch documentation for details concerning ELAN naming.

**7 Enter the link type.**

Select *Ethernet* or *Token Ring* according to your need.

**8 Enter the card numbers of the designated active NICs if the current card is to be a standby NIC.**

An entry in the Home Parameter field makes the current NIC (the NIC associated with the current card number) a standby NIC. Enter the card numbers (separated by commas) of the active NICs to be assigned to this standby NIC. When the Home Card parameter is set, any previously configured LECs with the same card number as the standby NIC are ignored.

*The Link LED of a standby NIC does not light until it assumes the configuration profile of a failed active NIC.*

**9 Enter the maximum frame size.**

- Enter 1514 when communicating with Ethernet LAN segments.
- Enter 4542 when communicating with 4 Mbps token ring LAN segments.
- Enter 9232 when communicating with 16 Mbps token ring LAN segments.

An end station can only communicate with end stations that are using the same maximum frame size, also known as the maximum transfer unit (MTU). Make sure that the ATM switch supports the specified maximum frame size.

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**10 Select the LEC configuration mode.**

- Select *Automatic* to contact the default LAN Emulation Configuration Server (LECS) through the Interim Local Management Interface (ILMI).
- Select *Manual* if you wish to contact a different LECS or bypass the LECS and connect directly to a LAN emulation server (LES).

**11 Enter the LECS network prefix if you selected *Manual* for the LEC Configuration Mode.**

The LECS network prefix is the first 13 bytes (26 characters) of the 20-byte ATM address of the ATM switch on which the target LECS resides. Enter the address without delimiters.

For example:

```
47000000000000000000000A1
```

**12 Enter the LECS user part if you selected *Manual* for the LEC Configuration Mode.**

This is the 7-byte hexadecimal (14-character) user part of the of the 20-byte target LECS ATM address. Enter the address without delimiters.

For example:

```
0E4A2C27456200
```

**13 Enter the LES network prefix if you selected *Manual* for the LEC Configuration Mode.**

The LES network prefix is the first 13 bytes (26 characters) of the 20-byte ATM address of the ATM switch on which the target LES resides. Enter the address without delimiters.

For example:

```
47000000000000000000000A1
```

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**14 Enter the LES user part if you selected *Manual* for the LEC Configuration Mode.**

This is the 7-byte hexadecimal (14-character) user part of the target LES address. Enter the address without delimiters.

For example:

```
0E4A2C27456200
```

**15 Select the VPI/VCI range.**

The default value is 0 bits VPI, 12 bits VCI. This value is determined by the ATM switch settings and must be the same for all end stations on the network.

**16 Select the ILMI VPI.**

The default value is 0. This value is determined by the ATM switch settings.

**17 Select the ILMI VCI.**

The default value is 16. This value is determined by the ATM switch settings.

**18 Select the signaling version.**

UNI 3.1 is the default value. Select the version of UNI supported by your switch.

**19 When you have set all the configuration values, press [F10] or [Esc] to move to the Driver Actions box.**

**20 Select *Save parameters and load driver.***

The install utility writes the appropriate *load* and *bind* commands to the AUTOEXEC.NCF file and loads the LEC.

If no errors are encountered, the dialog box shown in Figure 4-10 appears.

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**Figure 4-10** Prompt to Add Additional LEC

**21 Do one of the following:**

- Select *No* to complete and exit the configuration procedure.
- Select *Yes* to create and configure an additional LEC. The Additional Driver Actions screen appears, as shown in Figure 4-11.

**Figure 4-11** Additional Driver Actions Screen (Adding an Additional ELAN)

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*The screen shown in Figure 4-11 is the same screen shown in Figure 4-3, except that the newly installed LEC instance is displayed. Each LEC instance requires configuration of the same 3C975.LAN driver.*

**22 Choose *Select an additional driver* from the Additional Driver Actions box and press [Enter].**

The Select a Driver screen appears, as shown in Figure 4-12.

**Figure 4-12** Select a Driver Screen

**23 Select *3C975.LAN* in the Select a Driver box.**

The ELAN Configuration screen appears, as shown in Figure 4-7.

Go to step 1 at the beginning of this section and repeat the configuration procedure.

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## NetWare Card Numbers and Multiple Physical NICs

To connect a cable from the ATMLink NIC to the appropriate port on the ATM switch, you must know which physical NIC corresponds to a given NetWare card number.

All ATMLink LEC configurations include a card number that NetWare must correlate to a physical ATMLink NIC. LECs with the same card number are bound to the same physical NIC.

Using the ATMLink utility with the diagnostic utility is the quickest way to correlate physical NICs and NetWare card numbers. The diagnostic utility identifies each ATMLink NIC by MAC address and PCI slot number. The ATMLink utility identifies each NIC by the NetWare card number (NIC number) and the PCI slot number. Run the diagnostic utility to find out which ATMLink NICs are in which PCI slots. Then run the ATMLink utility to identify which card numbers are assigned to the NICs in the same PCI slots.

A more elaborate method to correlate physical NICs to PCI slot numbers is to observe the LEDs of the ATMLink NICs when the NetWare server is initialized.

When the first LEC is loaded, the driver correlates the card number with the first ATMLink NIC found on the PCI bus. When an LEC with a different card number is loaded, the driver correlates the new card number to the next ATMLink NIC found, and so on for all different card numbers detected. This process is repeated every time the server is booted.

As each LEC loads, the LED on the corresponding ATMLink NIC flashes slowly. In the sample AUTOEXEC.NCF file below, the LEC with card number 1 (cardnum=1) loads first, card number 3 loads second, and card number 2 loads third and fourth. Card number 4 is the fifth to load and is a standby NIC for card numbers 1, 2, and 3. The first ATMLink NIC found on the PCI bus is correlated to all LECs with card number 1, the second ATMLink NIC found is correlated to all LECs with card number 3, the third ATMLink NIC found is correlated to all LECs

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with card number 2, and the fourth ATMLink NIC found is recognized as a standby NIC. The first ATMLink NIC to flash during server initialization is card number 1, the next to flash is card number 3, and the last to flash is card number 2. The LEDs of standby NICs do not light up unless they become active NICs.

*The direction in which the computer scans the PCI bus differs with the manufacturer.*

```
load 3c975.lan cardnum=1 name=atm_1 elan=a (etc.)
load 3c975.lan cardnum=3 name=atm_2 elan=b (etc.)
load 3c975.lan cardnum=2 name=atm_3 elan=c (etc.)
load 3c975.lan cardnum=2 name=atm_4 elan=d (etc.)
load 3c975.lan cardnum=4 home=1,2,3 (etc.)
bind ipx atm_1 (etc.)
bind ipx atm_2 (etc.)
bind ipx atm_3 (etc.)
bind ipx atm_4 (etc.)
```

**CAUTION:** *The load order of the driver determines which physical NICs are bound to which drivers. Changing the sequence of load commands in the AUTOEXEC.NCF file may necessitate changing the cabling of the physical NICs.*

## Verifying Driver Installation and Configuration

*Check server driver installation*

To verify that the driver has been properly loaded on the NetWare server, perform the following procedures:

1. **At the system prompt, type:**

   **`load monitor`**

   The NetWare Monitor screen appears.

2. **Select *LAN/WAN Information* from the *Available Options* menu.**

   The *Available LAN Driver* menu appears. If the 3C975.LAN driver is properly loaded, it appears on this menu.

3. **Select *3C975.LAN* and view the displayed statistics.**

   A functioning driver displays packets being sent and received.

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*Check ability to connect over ATM link*

To verify that the server is communicating over the ATM link, perform the following procedure:

1. **Set up a NetWare client on an ELAN supported by the server to be tested.**

2. **Log in or map to the server.**

   If you cannot log in or map to the server, the ATM link is not functional.

## Editing the AUTOEXEC.NCF File

The experienced NetWare and ATM user can load network drivers, configure LECs, and set resilient server links by editing the AUTOEXEC.NCF file.

**CAUTION:** *If you are using an editor other than the NCF files option editor accessed from the* Installations Options *menu of the NetWare install utility, be sure that it can save files in pure ASCII text format.*

The four keywords required to configure an LEC are *cardnum, channel, elan,* and *linktype*. To make a NIC a standby NIC, use the *linktype, channel, home,* and *cardnum* keywords. In the 3Com implementation of LAN emulation, each NetWare channel can be an LEC that uses ILMI by default to find the LECS. The LEC may also be configured to contact another LECS or LES directly. Definitions and usage of keywords are listed in Table 4-2.

The sample AUTOEXEC.NCF file shown in Figure 4-13 represents the following scenario:

- All 3Com-supplied NLMs are loaded before the network drivers are loaded.
- There are two 3Com ATMLink NICs installed in the system, Card 1 and Card 2.
- Card 1 is configured with two LECs.
- Card 2 is configured as a standby NIC of Card 1.

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*Each LEC requires a separate* load *and* bind *command.*

```
;LOAD NLMs AVAILABLE FROM THE 3COM ATMDISK
;
load nbi.nlm
load msm.nlm
load ethertsm.nlm
load tokentsm.nlm
;
;**** NETWARE ELAN CONFIGURATION EXAMPLE ****
;
load 3c975.lan cardnum=1
frame=ethernet_802.2 linktype=1 channel=1
name=atm_1 elan=elan3372_1
;
load 3c975.lan cardnum=1
frame=ethernet_802.3 linktype=1 channel=2
name=atm_2 elan=elan3372_2 sig_version=1
max_frame_size=1514
;
bind ipx atm_1 net=6
bind ipx atm_2 net=7
;
;
;*****************************************
;EXAMPLE OF A RESILIENT LINK
;CARD 2 IS A STANDBY NIC FOR CARD 1
;ALWAYS LOAD THE ACTIVE NIC FIRST
;*****************************************
load 3c975.lan cardnum=2 home=1 linktype=1
channel=3
```

**Figure 4-13** Sample of AUTOEXEC.NCF File

**CAUTION:** *The load order of LECs determines which physical NICs are bound to which LECs. Changing the sequence of load commands in the AUTOEXEC.NCF file may necessitate changing the cabling of the physical NICs. See the section "NetWare Card Numbers and Multiple Physical NICs" for further information.*

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*Do not use the* bind *command for a standby NIC, or else NetWare will make it an active NIC. Always load an active NIC before its standby NIC.*

Table 4-2 describes the NetWare keywords to use when editing the AUTOEXEC.NCF file. Defaults are shown in bold.

**Table 4-2** NetWare Keywords

| Keyword | Range of Values (Default in Bold) | Usage Rules |
|---|---|---|
| ***Required Keywords*** | | |
| **cardnum** (card number) | 1, 2, 3, 4 | Assign each physical NIC a unique card number. |
| **channel** | 1–64 | Assign each LEC and standby NIC in the system a unique channel number. There are 64 possible LECs (16 per NIC, 4 NICs per system). |
| **ELAN** (ELAN name) | 1- to 32-character ASCII string | ELAN names should match ELAN names configured on the ATM switch. |
| **linktype** | **1** or 2 | 1=Ethernet, 2=token ring. All LECs with the same card number must have the same link type. A standby NIC must have the same link type as its active NICs. |
| ***Optional Keywords*** | | |
| **home** | 1, 2, 3, 4 | If cardnum=3 and home=1,2 then NIC 3 is a standby NIC for NIC 1 and NIC 2. |
| **max_frame _size** (maximum frame size for Ethernet and token ring) | 60–9232 | The default is 1514 for Ethernet frame size. Use 4542 for 4 Mbps token ring, and 9232 for 16 Mbps token ring. All LECs with the same card number must have the same maximum frame size. End stations with different maximum frame sizes cannot communicate. |
| **frame** | **ethernet_802.2**<br>ethernet_802.3<br>ethernet_II<br>ethernet_SNAP<br>token_ring<br>token_ring_SNAP | The driver defaults to the 802.2 frame type. |

(continued)

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**Table 4-2** NetWare Keywords (cont'd)

| Keyword | Range of Values (Default in Bold) | Usage Rules |
|---|---|---|
| **lec_config_mode** (LEC configuration mode) | **1**, 2 | 1=Automatic (uses ILMI or user-supplied LECS address)<br>2=Manual (must supply address for LES or LECS when using this option) |
| **lecs_np** (LECS network prefix) | Default is 13-byte network portion of ATM Forum Well-known Address. | Use the 13-byte network prefix of the switch on which the target LECS resides. |
| **lecs_up** (LECS user part) | 00a03e00000100 is default | Use the 7-byte user part of the 20-byte ATM address of the target LECS. |
| **les _np** (LES network prefix) | 26-character ASCII string (13 hex digits) | Use the 13-byte network prefix of the switch on which the target LES resides. |
| **les_up** (LES user part) | 14-character ASCII string (7 hex digits) | Use the 7-byte user part of the 20-byte ATM address of the target LES. |
| **maxvcc** (maximum number of virtual channel circuits) | 1–**1024** | The default value is 1,024 VCCs. With four NICs, the maximum number of open VCCs is 4,096. |
| **vpivci** (VPI/VCI range) | **0**, 1, 2, 3 | 0=0/12 bits (default)<br>1=1/11 bits<br>2=2/10 bits<br>3=8/4 bits<br>Be sure that the VPI/VCI range is the same for all installed NICs in the system. |
| **ilmi_vpi** (VPI for ILMI) | Depends on ATM switch settings | The default value is 0. |
| **ilmi_vci** (VCI for ILMI) | Depends on ATM switch settings | The default value is 16. |
| **rate** | 1–**155** | Sets the maximum bandwidth in Mbps available to an LEC. |
| **sig_version** (signaling version) | 0, **1** | 0=UNI v3.0<br>1=UNI v3.1 (default)<br>Make sure that all installed NICs in the system use the same signaling version. |

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## Removing an LEC from NetWare

To remove an LEC from the AUTOEXEC.NCF file, follow these steps:

1 **From the system prompt, enter the command:**

```
load install
```

The Installation Options screen shown in Figure 4-1 appears.

2 **Select *NCF files options*.**

This opens the AUTOEXEC.NCF file for editing.

3 **Delete the *load* and *bind* commands of the ELAN that you want to remove.**

The 3C975.LAN driver name can appear in either the *load* or *bind* commands as follows:

```
load 3c975.lan cardnum=1
frame=ethernet_802.2 linktype=1 channel=1
name=atm_1 elan=elan3372_1 vpivci=2
SIG_VERSION=1 max_frame_size=1514
;
bind ipx atm_1 net=6
```

4 **Save and exit the AUTOEXEC.NCF file.**

5 **Exit the NetWare install utility.**

*The load order of the driver determines which physical NICs are bound to which drivers. Changing the sequence of load commands in the AUTOEXEC.NCF may necessitate changing the cabling of the physical NICs. See the section "NetWare Card Numbers and Multiple Physical NICs" for further information.*

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# 5 ATMLink Utility

This chapter describes the Windows NT and Novell NetWare versions of the 3Com ATMLink utility.

The ATMLink utility reads and displays read-only ELAN connection statistics and NIC configuration parameters. Active connection statistics are updated every 5 seconds. The utility can also reset the network driver of individual NICs.

## Installing and Running the ATMLink Utility for Windows NT

The ATM utility is shipped in the root directory of the *ATMDisk* diskette for Windows NT as the file ATMUTIL.EXE. The ATMLink utility files are copied automatically to the System32 subdirectory during driver installation.

To run the ATMLink utility, perform the following procedure:

1 **Add a new Program Item and ATMLink icon in the Program Group of your choice.**

2 **Double-click the ATMLink icon to launch the ATMLink utility.**

The ATMLink utility windows appears, as shown in Figure 5-1.

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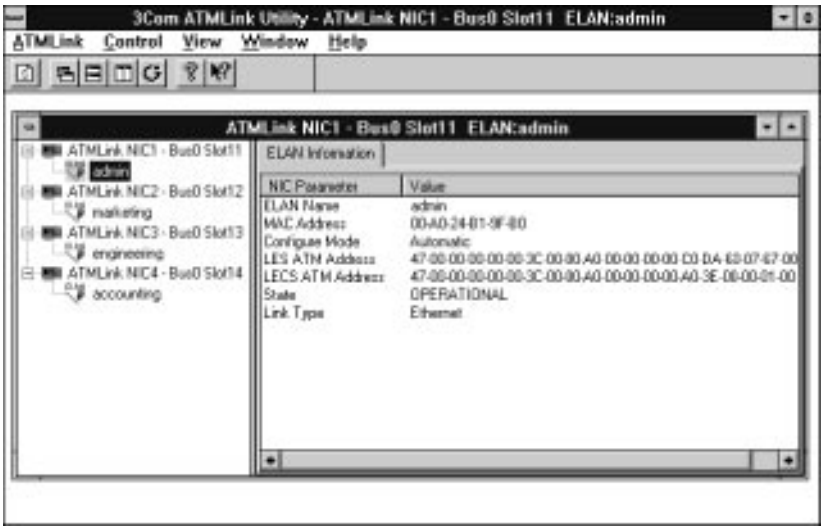


**Figure 5-1** ATMLink Utility Windows

## ATMLink Utility Field Descriptions

The ATMLink utility displays information for correctly installed ATMLink NICs and LAN emulation clients (LECs).

### ELAN Information

To view ELAN information, click the name of the ELAN on the directory tree in the left portion of the window, as shown in Figure 5-2.

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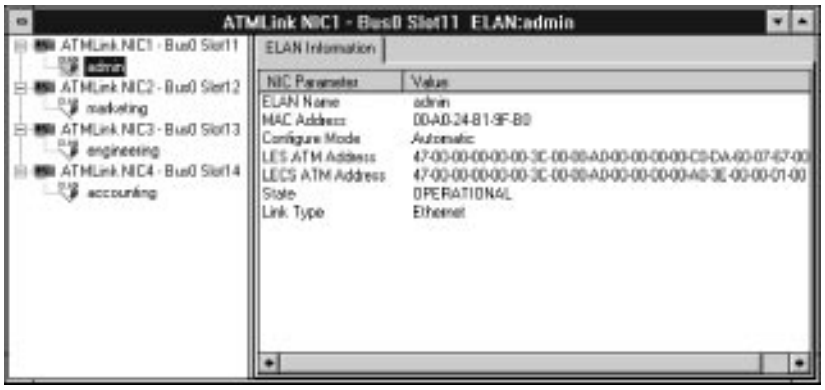


**Figure 5-2** ELAN Information Window

Table 5-1 explains the Windows NT ELAN information fields.

**Table 5-1** Windows NT ELAN Information Fields

| Field | Description |
|---|---|
| ELAN Name | Name of the ELAN, as configured by the user or supplied by the LES |
| MAC Address | MAC address of the selected ELAN (as an increment of the NIC base MAC address) |
| Configure Mode | ■ Automatic—ATMLink LEC uses ILMI to connect with the LES<br>■ Automatic LECS—ATMLink LEC uses the ATM Forum Well-known Address or another ATM address to connect with the LECS<br>■ Manual—ATMLink LEC connects to LES directly |
| LES ATM Address | LES address used by ATMLink LEC when Configure Mode is set to Manual |
| LECS ATM Address | LECS address used by ATMLink LEC when Configure Mode is set to Automatic LECS |
| State | ■ Down—ATMLink LEC is not joined to an ELAN<br>■ Initializing—ATMLink LEC is joining an ELAN<br>■ Operational—ATMLink LEC is joined to an ELAN |
| Link Type | ■ Ethernet<br>■ Token ring |

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## NIC Connection Statistics

To view NIC connection statistics, click the name of the NIC on the directory tree in the left portion of the window, and then click the Connections Stats tab in the right portion of the window, as shown in Figure 5-3.

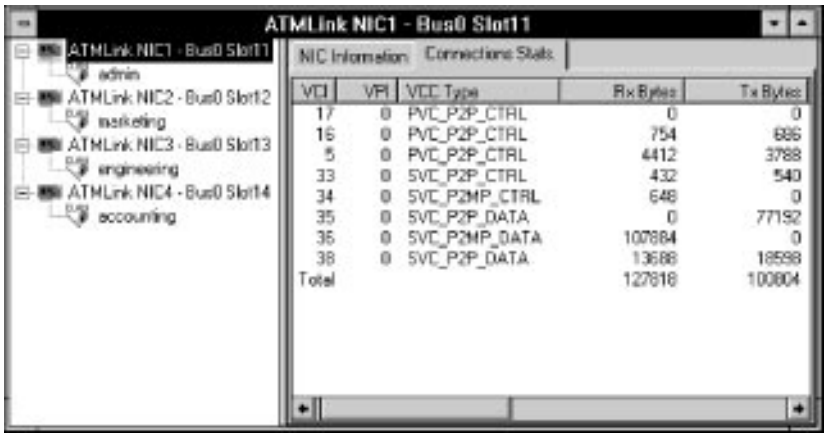


**Figure 5-3** Connection Statistics Window

NIC connection statistic fields are explained in Table 5-2.

**Table 5-2** Windows NT Connection Statistics Fields

| Field | Displayed Value |
|---|---|
| VCI | Numeric virtual circuit identifier of the indicated virtual circuit |
| VPI | Numeric virtual path identifier of the indicated virtual circuit |
| VCC Type | Type of virtual channel connection used by the ATMLink LEC<br>■ PVC_P2P_CTRL—permanent virtual circuit, point to point, control<br>■ PVC_P2P_DATA—permanent virtual circuit, point to point, data<br>■ SVC_P2P_CTRL—switched virtual circuit, point to point, control<br>■ SVC_P2P_DATA—switched virtual circuit, point to multipoint, data<br>■ SVC_P2MP_CTRL—switched virtual circuit, point to multipoint, control<br>■ SVC_P2MP_DATA—switched virtual circuit, point to multipoint, data |
| RxBytes | Cumulative total of bytes received since the utility was initialized |
| TxBytes | Cumulative total of bytes transmitted since the utility was initialized |

(continued)

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**Table 5-2** Windows NT Connection Statistics Fields (continued)

| Field | Displayed Value |
|---|---|
| RxBytes/sec | Average number of bytes received per second over a 5-second sampling interval |
| TxBytes/sec | Average number of bytes transmitted per second, over a 5-second sampling interval |
| RxCells | Cumulative total of ATM cells received since initialization of the utility |
| TxCells | Cumulative total of ATM cells transmitted since initialization of the utility |
| RxCells/sec | Average number of ATM cells received per second over a 5-second sampling |
| TxCells/sec | Average number of ATM cells transmitted per second, over a 5-second sampling |

## NIC Information

To view NIC information, click the name of a NIC on the directory tree in the left portion of the window, and then click the NIC Information tab in the right portion of the window, as shown in Figure 5-4.

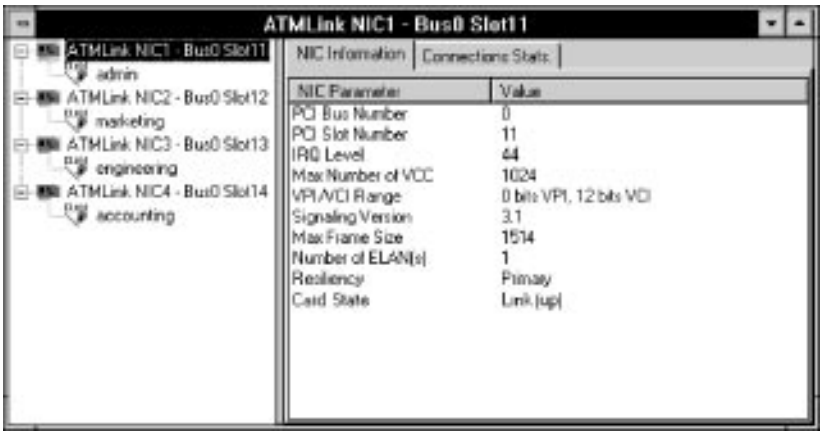


**Figure 5-4** NIC information Window

The NIC Information screen displays the configuration parameters of the selected physical NIC.

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The bus number, slot number, and IRQ values are set by the system BIOS. The maximum number of VCCs is preset by the network driver. All other values are set by using the ATMLink install utility. See Chapter 3 for more information on configuring and reconfiguring NICs and ELANs.

Table 5-3 describes the NIC information fields.

**Table 5-3** Windows NT NIC Information Fields

| Field | Displayed Values |
|---|---|
| PCI Bus Number | Number of the PCI bus on which the selected NIC is installed |
| PCI Slot Number | Number of the PCI slot into which the selected NIC is inserted |
| IRQ Level | Interrupt request level assigned to the selected NIC by the operating system |
| Max Number of VCC | 1024 |
| VPI/VCI Range | ■ 0 bits VPI, 12 bits VCI<br>■ 1 bits VPI, 11 bits VCI<br>■ 2 bits VPI, 10 bits VCI<br>■ 4 bits VPI, 8 bits VCI |
| Signaling Version | ■ UNI 3.0<br>■ UNI 3.1 |
| Max Frame Size | ■ 1514—default value for Ethernet link type<br>■ 4542—default value for 4 Mbps token ring link type<br>■ 9232—default value for 16 Mbps token ring link type |
| Number of ELANs | 0–16—number of LECs configured on selected NIC |
| Resiliency | ■ Primary—the selected NIC is an active NIC<br>■ Standby—the selected NIC is a standby NIC |
| Card State | ■ Link up<br>■ Link down |

## Reset

Selecting *Reset* from the *Control* menu reinitializes the network driver for the selected NIC. All link and ATM open connections of the NIC are momentarily lost, but reestablished when the driver reactivates.

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Use the *Reset* option if the NIC appears to be unresponsive.

To access the *Reset* option, select *Reset* from the *Control* menu, as shown in Figure 5-5.

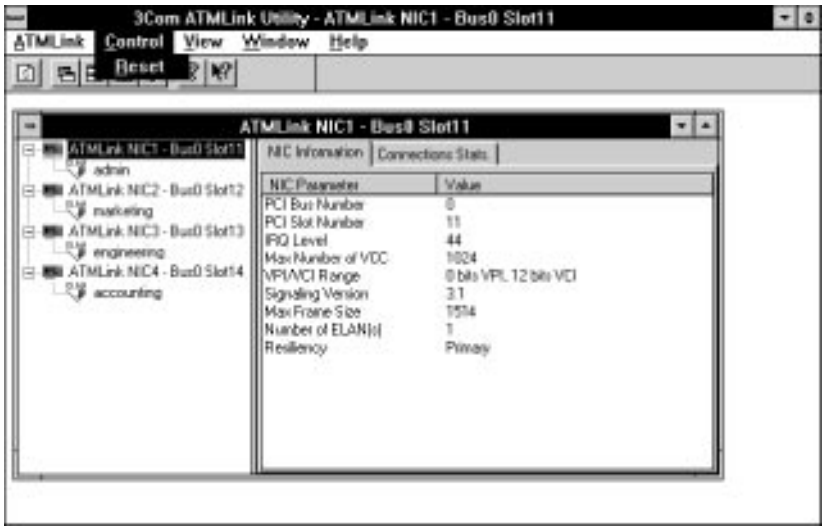


**Figure 5-5** Reset Option for Windows NT

## Installing and Running the ATMLink Utility for Novell NetWare

The ATMLink utility is shipped as the 3C975UTL.NLM file in the root directory of the *ATMDisk* diskette for Novell NetWare.

*The ATMLink utility for NetWare can display information for only one NIC at a time.*

To install and run the ATMLink Utility, perform the following procedure:

1. **Copy the file named 3C975UTL.NLM from the *ATMDisk* diskette to the NetWare server subdirectory.**

2. **From the server prompt, type:**

   ```
   load 3C975UTL
   ```

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The ATMLink Utility Select a NIC screen appears, as shown in Figure 5-6.

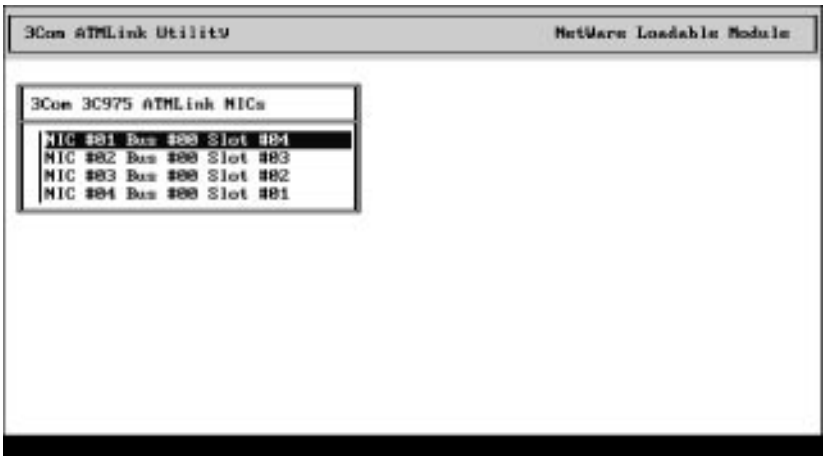
3Com ATMLink Utility
NetWare Loadable Module
3Com 3C975 ATMLink NICs
NIC #01 Bus #00 Slot #04
NIC #02 Bus #00 Slot #03
NIC #03 Bus #00 Slot #02
NIC #04 Bus #00 Slot #01

**Figure 5-6** NetWare ATM Utility Select a NIC Screen

**3 Use the arrow keys to select an installed ATMLink NIC, and then press [Enter].**

*The NIC number shown in Figure 5-6 is the NetWare card number.*

The ATMLink utility main menu appears, as shown in Figure 5-7.

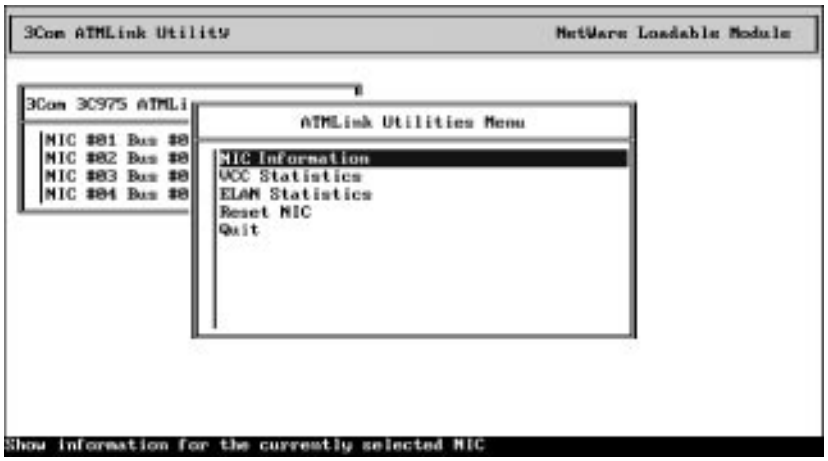


**Figure 5-7** NetWare ATMLink Utility Main Menu

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## ATMLink Utility Menu Options

Use the arrow keys to select from the following options:

- NIC Information
- VCC Statistics
- ELAN Statistics
- Reset NIC
- Quit

Press [Enter] to display the selected information.

### NIC Information

The NIC Information screen, as shown in Figure 5-8, displays the configuration parameters of the selected physical NIC.

The bus number, slot number, and IRQ values are set by the system BIOS. All other values are set through the install utility or by manually editing the AUTOEXEC.NCF file. See Chapter 4 for details.

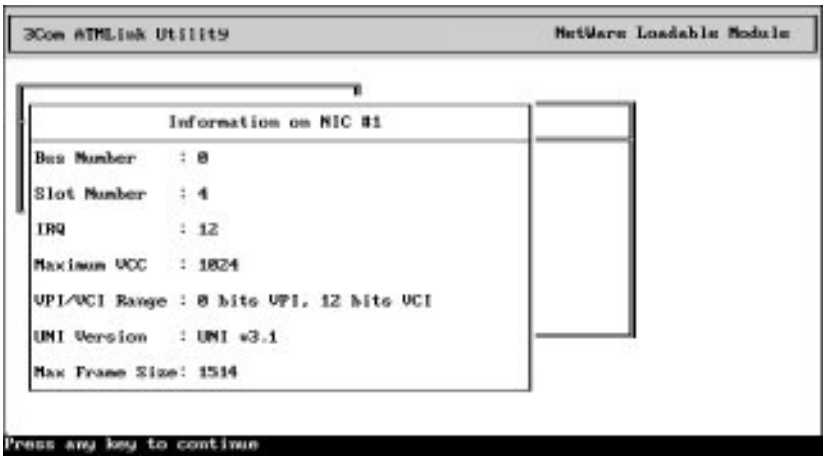
3Com ATMLink Utility
NetWare Loadable Module
Information on NIC #1
Bus Number : 0
Slot Number : 4
IRQ : 12
Maximum VCC : 1024
VPI/VCI Range : 0 bits VPI, 12 bits VCI
UNI Version : UNI v3.1
Max Frame Size: 1514
Press any key to continue

**Figure 5-8** NetWare NIC Information Screen

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Table 5-4 lists the range of values that can be displayed on the NIC Information screen.

**Table 5-4** NetWare NIC Information Fields

| Field | Displayed Value |
|---|---|
| Bus Number | Number of the PCI bus on which the selected NIC is installed |
| Slot Number | Number of the PCI slot into which the selected NIC is inserted |
| IRQ | Interrupt request level assigned to the selected NIC by the operating system |
| Maximum VCC | 1024—The maximum number of open VCCs per system |
| VPI/VCI Range | ■ 0 bits VPI, 12 bits VCI<br>■ 1 bits VPI, 11 bits VCI<br>■ 2 bits VPI, 10 bits VCI<br>■ 4 bits VPI, 8 bits VCI |
| UNI Version | ■ UNI 3.0<br>■ UNI 3.1 |
| Max Frame Size | 60–9232<br>■ 1514—default value for Ethernet link type<br>■ 4542—default value for 4 Mbps token ring link type<br>■ 9232—default value for 16 Mbps token ring link type |

## VCC Statistics

The VCC Statistics screen, shown in Figure 5-9, displays a table of the current open connections established between the selected NIC and the ATM network.

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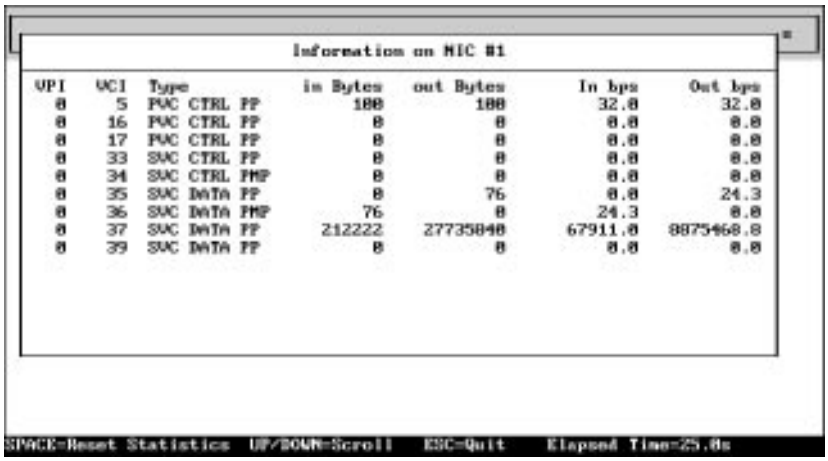
Information on NIC #1
VPI VCI Type in Bytes out Bytes In bps Out bps
0 5 PVC CTRL PP 100 100 32.0 32.0
0 16 PVC CTRL PP 0 0 0.0 0.0
0 17 PVC CTRL PP 0 0 0.0 0.0
0 33 SVC CTRL PP 0 0 0.0 0.0
0 34 SVC CTRL PMP 0 0 0.0 0.0
0 35 SVC DATA PP 0 76 0.0 24.3
0 36 SVC DATA PMP 76 0 24.3 0.0
0 37 SVC DATA PP 212222 27735040 67911.0 8875468.8
0 39 SVC DATA PP 0 0 0.0 0.0
SPACE=Reset Statistics UP/DOWN=Scroll ESC=Quit Elapsed Time=25.8s

**Figure 5-9** VCC Statistics Screen

Table 5-5 describes the NetWare VCC statistics fields.

**Table 5-5** NetWare VCC Statistics Screen

| Field | Description |
|---|---|
| VCI | Numeric virtual circuit identifier of the indicated virtual circuit |
| VPI | Numeric virtual path identifier of the indicated virtual circuit |
| VCC Type | Indicates the type of virtual channel connection used by the ATMLink LEC<br>■ PVC P2P CTRL—permanent virtual circuit, point to point, control<br>■ PVC P2P DATA—permanent virtual circuit, point to point, data<br>■ SVC P2P CTRL—switched virtual circuit, point to point, control<br>■ SVC P2P DATA—switched virtual circuit, point to multipoint, data<br>■ SVC P2MP CTRL—switched virtual circuit, point to multipoint, control<br>■ SVC P2MP DATA—switched virtual circuit, point to multipoint, data |
| In Bytes | Cumulative total of bytes received since the utility was initialized |
| Out Bytes | Cumulative total of bytes transmitted since the utility was initialized |
| In bps | Average number of bits received per second over a 5-second sampling interval |
| Out bps | Average number of bits received per second over a 5-second sampling interval |

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## ELAN Statistics

When you select the *ELAN Statistics* option from the main menu, the ATMLink utility displays two screens, the Currently Configured LECs screen, as shown in Figure 5-10, and the LEC Statistics screen, as shown in Figure 5-11.

The Currently Configured LECs screen displays the ELAN names of all LECs configured on the selected NIC. See Chapter 4 for information on ELAN names and configuring LECs.

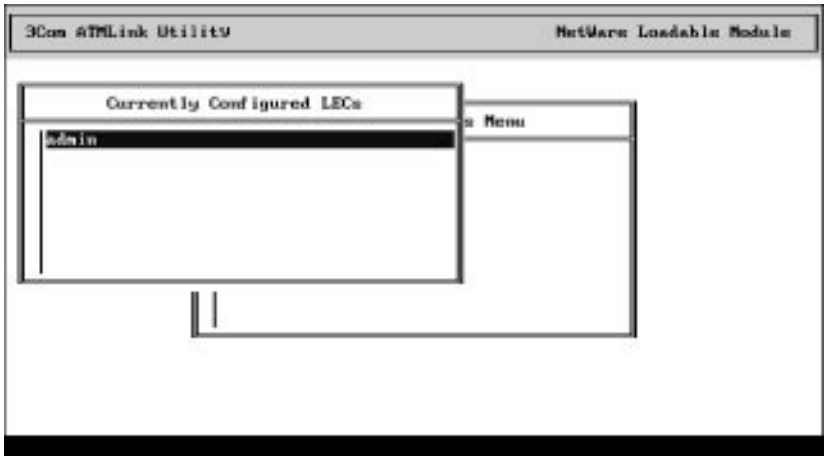


**Figure 5-10** Currently Configured LECs Screen

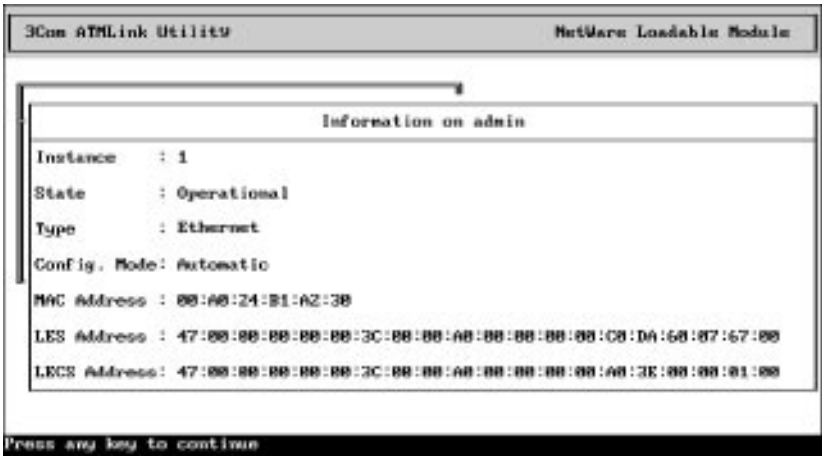


**Figure 5-11** LEC Statistics Screen

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The LEC Statistics screen displays configuration information and the operational status of the selected ELAN.

*Check the* State *field of the LEC Statistics screen to verify that an LEC has successfully joined an ELAN.*

Table 5-6 describes the fields displayed in the LEC Statistics screen.

**Table 5-6** LEC Statistics Fields for NetWare

| Field | Description |
|---|---|
| Instance | The channel number assigned to the LEC |
| State | ■ Operational—LEC is joined to an ELAN<br>■ Down—LEC is not joined to an ELAN<br>■ Initializing—LEC is in process of joining an ELAN |
| Type | ■ Ethernet—LEC is configured to join an Ethernet ELAN<br>■ Token ring—LEC is configured to join a token ring ELAN |
| Config. Mode | ■ Automatic—LEC uses ILMI to obtain LECS address<br>■ Manual—LEC uses the ATM Forum Well-known Address, or another address to obtain LECS address, or LEC connects directly with LES |
| MAC Address | MAC address assigned to LEC; it is an increment of the NIC base MAC address |
| LES Address | LES address used by LEC; specified when the Configuration mode is set to manual |
| LECS Address | Address of LECS used by LEC upon initialization |

## Reset NIC

Selecting *Reset* from the main menu reinitializes the network driver for the selected NIC. All link and ATM open connections of the NIC are momentarily lost but reestablished when the driver reactivates.

Use the *Reset* option if the NIC appears to be unresponsive.

## Quit

Select *Quit* to exit the ATMLink utility for NetWare.

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# 6 DIAGNOSTICS AND TROUBLESHOOTING

This chapter describes how to use the ATMLink diagnostic utility program shipped on the *ATMDisk* diskettes.

## Overview

The ATMLink diagnostic utility and its associated help files are in the root directory of the *ATMDisk* diskettes. The diagnostic utility is an MS-DOS® program (3C975CFG.EXE) that performs the following key functions:

- Detects and reports the PCI-bus slot number, interrupt request level, base MAC address, and other configuration data of all installed 3Com ATMLink physical NICs
- Tests the operation of the 3C975 ATMLink NIC on-board circuitry
- Displays EEPROM-based device information for each 3C975 ATMLink NIC

The diagnostic test suite is divided into two groups, the internal and external tests. Six internal tests check the integrity of the segmentation and reassembly (SAR) controller and associated components. The external loopback test checks the integrity of the on-board transceiver and cable connectors. To run the external loopback test, you must use a loopback plug. To construct a loopback plug, see the section "Constructing Loopback Plugs" later in this chapter.

Any individual test in the suite can be enabled or disabled. These test configuration settings can be saved to disk. Test results can be viewed on-screen or printed.

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## When to Use the Diagnostic Utility

*3Com suggests that you run the diagnostic utility immediately after installing the 3C975 ATMLink NIC, and before installing the network drivers.*

Use the diagnostic utility in the following cases:

- To verify that the hardware works before the network drivers are installed

  If the NIC or the PCI bus is not functioning properly, you save the trouble of loading and configuring the network driver and ELANs.

- If you want to correlate the PCI slot number with the MAC address of a 3C975 ATMLink NIC

  You need this information for installing and configuring Windows NT network drivers when there is more than one physical NIC in the system.

- If the network drivers fail to load

  The internal and external tests determine whether the components on the NIC are functioning correctly.

- If there is no network activity, or if irregular activity is reported by the server or the switch

- If you require specific manufacturer's information about the 3C975 ATMLink NIC

  The diagnostic utility reports the product revision number, date of manufacture, SRAM size, EEPROM size, and the MAC address of each installed 3C975 ATMLink NIC.

- If you require specific configuration information about the 3C975 ATMLink NIC

  The diagnostic utility reports the device number, bus number, slot number, I/O port address, and interrupt request level (IRQ).

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## How to Use the Diagnostic Utility

The diagnostic utility is a DOS program. It can be run directly from the *ATMDisk* diskette or copied, with its help file, to the system hard drive and run from a directory of your choice. The diagnostic utility must be run from DOS with no network drivers loaded. Table 6-1 describes the suggested method of accessing DOS from your network operating system (NOS).

*The diagnostic utility cannot be run from an MS-DOS window.*

**Table 6-1** Accessing MS-DOS

| NOS | Method of Accessing DOS |
|---|---|
| Novell NetWare | Down the server and exit to DOS. |
| Windows NT | Reboot the system with an MS-DOS system diskette (MS-DOS version 6.20 or later). |

### Starting the Diagnostic Utility

This guide documents the internal and external test procedures separately.

*Make sure that the 3C975 ATMLink NIC is firmly seated in a functional PCI slot before running the diagnostic utility. (See Chapter 2 for hardware installation details.)*

To run the diagnostic utility directly from the *ATMDisk* diskette, perform the following procedure:

1. **Shut down all applications and processes running on the Windows NT or NetWare system, and exit to DOS as described in Table 6-1.**
2. **Insert the appropriate *ATMDisk* diskette in the floppy drive.**
3. **Change to the root directory of the floppy drive and type:**

   **`3C975CFG.EXE [Enter]`**

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The diagnostic utility main screen appears, as shown in Figure 6-1.

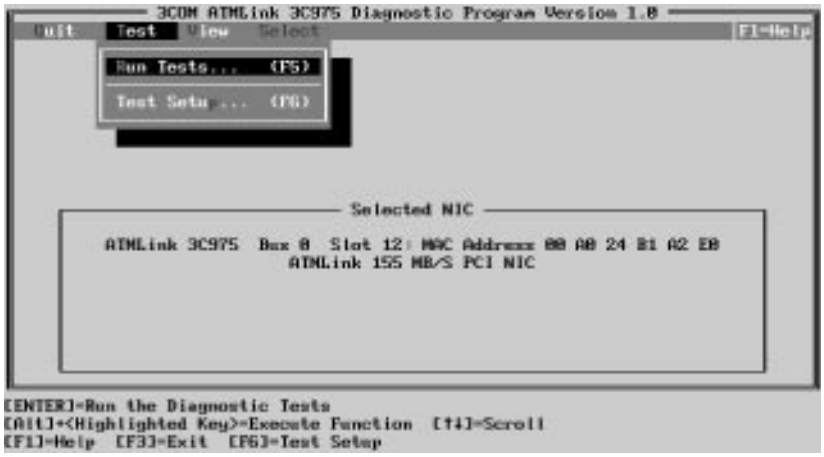


**Figure 6-1** Diagnostic Utility Main Screen

## Navigating Within the Diagnostic Utility

Use a mouse (if a mouse driver is loaded) or the keyboard to access the diagnostic utility's character-based interface. In this guide it is assumed that a mouse is used. Keyboard commands are described in Table 6-2.

**Table 6-2** Function Key Descriptions of the Diagnostic Utility

| Keystroke | Action |
|---|---|
| [Esc] | Exit to previous screen |
| [Tab] | Move cursor to next field |
| [Shift]+[Tab] | Move cursor to previous field |
| [Alt]+[Highlighted letter] | Execute indicated function |
| Up and Down arrow keys | Move cursor up and down a list |
| [F1] | Display Help screen for highlighted item |
| [F3] | Exit to MS-DOS |
| [F5] | Display Run Tests screen |
| [F6] | Display Test Setup screen |
| [F8] | Display NIC Information screen |
| [F9] | Display NIC Statistics screen |
| [Esc] | Exit to previous screen |

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## Running the Internal Tests

The internal tests check the integrity of the on-board ASIC circuitry. The types of tests and number of test repetitions are set to the default values (that is, Internal tests enabled, External test disabled, and 10 repetitions per test).

To run all the internal tests, perform the following procedure:

1 **Physically disconnect the 3Com ATMLink NICs from the network.**

2 **From the *Select* menu item on the main screen, select the NIC to be tested.**

The *Select* menu is disabled if there is only one physical NIC installed in the system.

*The MAC address identifies the physical NIC being tested. The MAC address is the 12-digit hexadecimal number on the small bar code label on the component side of the NIC.*

3 **From the *Test* menu, select *Test Setup*.**

The Test Setup screen appears, as shown in Figure 6-2.

**Figure 6-2** Test Setup Screen

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**4 Verify that all the internal tests are enabled.**

If they are not, click the *Enable All* button to set all internal tests to *Enabled*.

**5 In the Test Select box, select *Ext Loopback Test* and verify that the External Loopback Test is disabled.**

If the External Loopback Test is not disabled, click *Disable All*.

**6 Click *OK*.**

The main screen shown in Figure 6-1 reappears.

**7 From the *Test* menu, select *Run Tests*.**

The Run Tests screen appears, as shown in Figure 6-3.

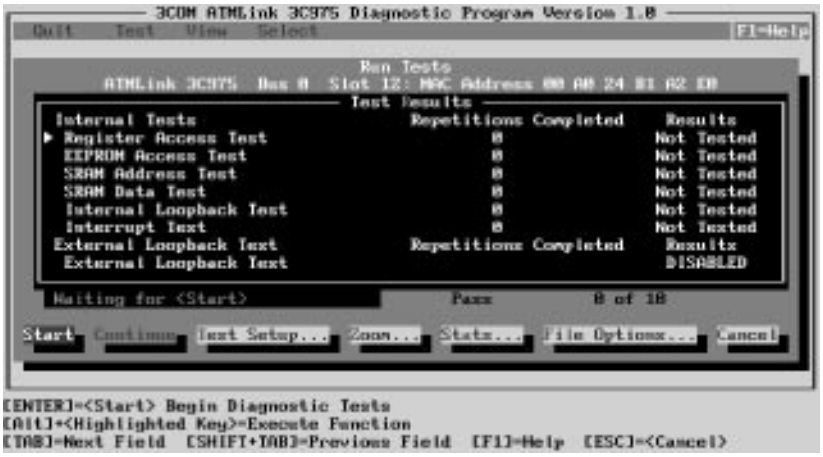
3COM ATMLink 3C975 Diagnostic Program Version 1.0
Quit Test View Select F1=Help
Run Tests
ATMLink 3C975 Bus 0 Slot 12: MAC Address 00 A0 24 81 A2 E0
Test Results
Internal Tests
Repetitions Completed
Results
Register Access Test 0 Not Tested
EEPROM Access Test 0 Not Tested
SRAM Address Test 0 Not Tested
SRAM Data Test 0 Not Tested
Internal Loopback Test 0 Not Tested
Interrupt Test 0 Not Tested
External Loopback Test
Repetitions Completed
Results
External Loopback Test DISABLED
Waiting for <Start>
Pass 0 of 10
Start Continue Test Setup... Zoom... Stats... File Options... Cancel
[ENTER]=<Start> Begin Diagnostic Tests
[Alt]+<Highlighted Key>=Execute Function
[TAB]=Next Field [SHIFT+TAB]=Previous Field [F1]=Help [ESC]=<Cancel>

**Figure 6-3** Run Tests Screen

**8 Click *Start* to run the internal tests.**

**9 If any test fails, go to the section "What to Do If a Test Fails" later in this chapter.**

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## Running the External Loopback Test

Run the External Loopback Test to check the integrity of the on-board transceiver and cable connectors. To run the External Loopback Test, you must use a loopback plug. For instructions on constructing a loopback plug, see the section "Constructing Loopback Plugs" later in this chapter.

**CAUTION:** *Do not run the External Loopback Test when the 3C975 ATMLink NIC is cabled to another device.*

To run the external loopback test only, perform the following procedure:

1. **Insert the loopback plug into the 3Com ATMLink NIC.**
2. **From the *Select* menu on the diagnostic utility main screen, select the 3C975 ATMLink NIC to be tested.**

*The PCI slot number or the MAC address of the NIC identifies the physical NIC being tested. The MAC address is a 12-digit hexadecimal number on the small bar code label on the component side of the NIC.*

3. **Select *Test Setup* from the *Test* menu.**

   The Test Setup screen appears, as previously shown in Figure 6-2.

4. **Click *Disable All* to disable all internal tests.**
5. **In the Test Select Box, select *Ext Loopback Test*.**

   The External Loopback Test screen appears, as shown in Figure 6-4.

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**Figure 6-4** External Loopback Test Screen

**6 Verify that the External Loopback Test is enabled.**

If the External Loopback Test is disabled, click *Enable All*.

**7 Click *OK*.**

The main screen shown in Figure 6-1 reappears.

**8 From the *Test* menu, select *Run Tests*.**

The Run Tests screen appears, as shown in Figure 6-5.

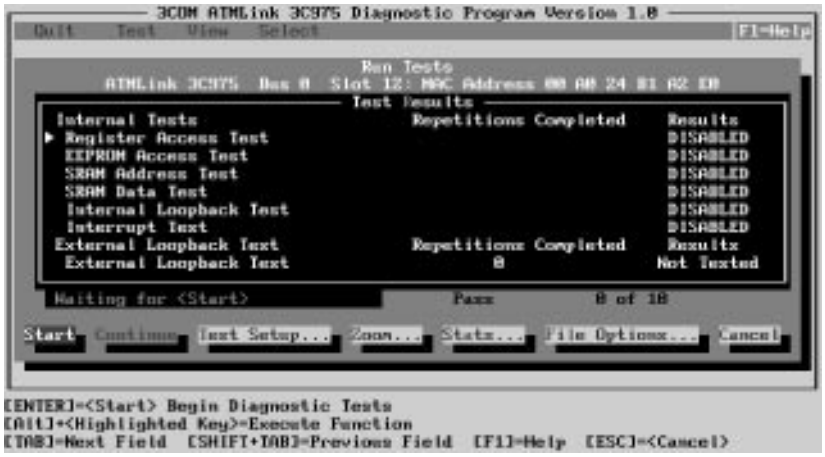
3COM ATMLink 3C975 Diagnostic Program Version 1.0
Quit Test View Select F1=Help
Run Tests
ATMLink 3C975 Bus 0 Slot 12: MAC Address 00 A0 24 81 A2 E0
Test Results
Internal Tests Repetitions Completed Results
Register Access Test DISABLED
EEPROM Access Test DISABLED
SRAM Address Test DISABLED
SRAM Data Test DISABLED
Internal Loopback Test DISABLED
Interrupt Test DISABLED
External Loopback Test Repetitions Completed Results
External Loopback Test 0 Not Tested
Waiting for <Start>
Pass 0 of 10
Start Continue Test Setup... Zoom... Stats... File Options... Cancel
[ENTER]=<Start> Begin Diagnostic Tests
[Alt]+<Highlighted Key>=Execute Function
[TAB]=Next Field [SHIFT+TAB]=Previous Field [F1]=Help [ESC]=<Cancel>

**Figure 6-5** Run Tests Screen

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**9** **Click *Start* to run the External Loopback Test.**

The test runs ten times by default. If you want to change the number of test repetitions, click *Test Setup*.

**10** **If the test fails, go to the section "What to Do If a Test Fails" later in this chapter.**

**11** **Remove the loopback plug and insert the network cable.**

## Viewing Test Results

The Test Results screen shown in Figure 6-6 appears after the tests have been run, showing the number of times each test was run and the pass/fail results.

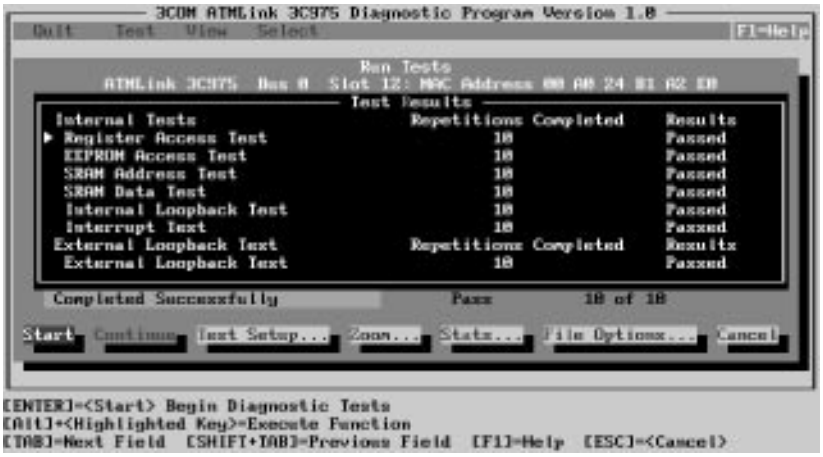
3COM ATMLink 3C975 Diagnostic Program Version 1.0
Quit Test View Select F1=Help
Run Tests
ATMLink 3C975 Bus 0 Slot 12: MAC Address 00 A0 24 B1 A2 E0
Test Results
Internal Tests Repetitions Completed Results
Register Access Test 10 Passed
EEPROM Access Test 10 Passed
SRAM Address Test 10 Passed
SRAM Data Test 10 Passed
Internal Loopback Test 10 Passed
Interrupt Test 10 Passed
External Loopback Test Repetitions Completed Results
External Loopback Test 10 Passed
Completed Successfully Pass 10 of 10
Start Continue Test Setup... Zoom... Stats... File Options... Cancel
[ENTER]=<Start> Begin Diagnostic Tests
[Alt]+<Highlighted Key>=Execute Function
[TAB]=Next Field [SHIFT+TAB]=Previous Field [F1]=Help [ESC]=<Cancel>

**Figure 6-6** Test Results Screen

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## NIC Statistics

Internal and external test results are also reported in the form of NIC statistics. To view the NIC Statistics screen, shown in Figure 6-7, click *Stats* on the Run Tests screen.

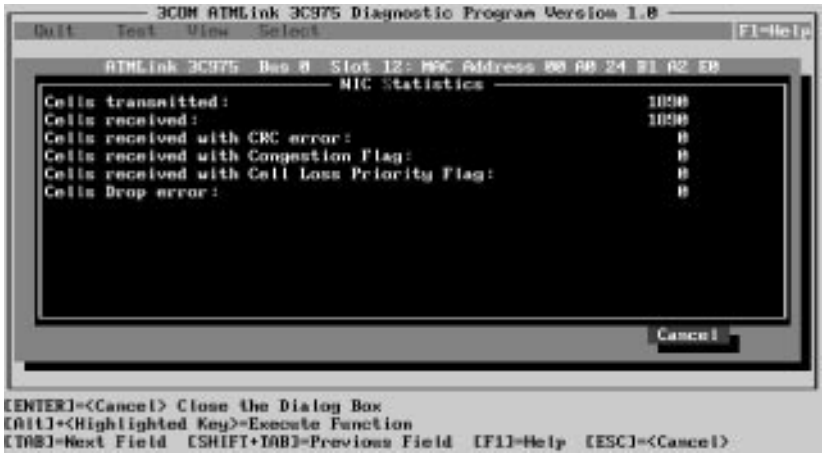
3COM ATMLink 3C975 Diagnostic Program Version 1.0
Quit Test View Select F1=Help
ATMLink 3C975 Bus 0 Slot 12: MAC Address 00 A0 24 81 A2 E8
NIC Statistics
Cells transmitted: 1090
Cells received: 1090
Cells received with CRC error: 0
Cells received with Congestion Flag: 0
Cells received with Cell Loss Priority Flag: 0
Cells Drop error: 0
Cancel
[ENTER]=<Cancel> Close the Dialog Box
[Alt]+<Highlighted Key>=Execute Function
[TAB]=Next Field [SHIFT+TAB]=Previous Field [F1]=Help [ESC]=<Cancel>

**Figure 6-7** NIC Statistics Screen

## Individual Test Information

To run a test continuously, disable the *Halt on Error* option. The test continues to gather statistics and does not stop when a failure occurs. When the test is concluded, the Test Information screen displays the number of successful completions and failures.

To view the Test Information screen, shown in Figure 6-8, select a test from the Run Tests screen and click *Zoom*.

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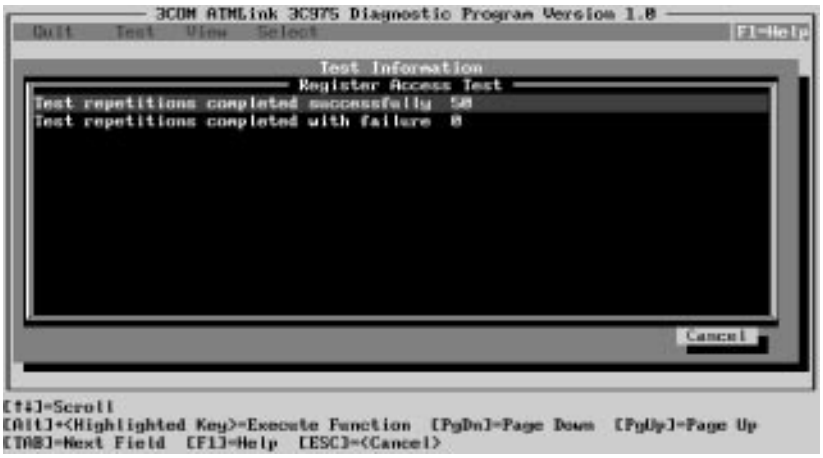
3COM ATMLink 3C975 Diagnostic Program Version 1.0
Quit Test View Select F1=Help
Test Information
Register Access Test
Test repetitions completed successfully 50
Test repetitions completed with failure 0
Cancel
[↑↓]=Scroll
[Alt]+<Highlighted Key>=Execute Function [PgDn]=Page Down [PgUp]=Page Up
[TAB]=Next Field [F1]=Help [ESC]=<Cancel>

**Figure 6-8** Test Information Screen

## Changing the Test Setup

In rare cases, such as intermittent faults, you may wish to change the default values of the diagnostic utility. Otherwise, no changes to defaults are necessary in order to detect the most common error conditions.

### Enabling and Disabling Individual Tests

To enable and disable individual tests, follow these steps:

1. From the diagnostic utility main screen, select *Test Setup* from the *Test* menu.
2. Use the mouse or [Tab] and arrow keys to select any of the fields within the Test Setup box.
3. Press the [Space Bar] to enable or disable the selected test.
4. When you are satisfied with the new test setup, click *OK*.
5. To run the tests, choose *Run Tests* from the *Test* menu and click *Start*.

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### Changing the Number of Repetitions

All tests are set by default to run 10 times and to halt when an error occurs. To change the number of repetitions, enter a new value in the Times field of the Repetitions box of the Test Setup screen (Figure 6-2).

### Changing Action on Error

To test for suspected intermittent errors, clear the *Halt On Error* option and select *Continuous*.

## File Options

The *File Options* button appears in the Test Setup and Run Tests screens. Use File Options to save, load, and print your test setup configurations and results.

Test setup configuration data is saved to a file named 3C975.TST. This file contains the following test setup parameters:

- Halt on error (yes or no)
- Number of test repetitions
- Status of internal and external NIC tests (enable or disable)

Load the 3C975.TST configuration file to set the parameters of the current diagnostic test to those saved in the file.

Test results are saved to an ASCII text file named 3C975.RPT. All subsequent saved test results are appended to this file and are not saved separately.

A sample test result report is shown in Figure 6-9.

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```
3Com 3C975 NIC Diagnostic Program Test
Results Report

Diagnostic tests started at: 10/4/96, 16:29:34

System Information:
-------------------

Processor Type 80X86
Processor Mode 16-bit Real Mode
Processor Speed 87MHz
DMA Services Available: NO
EMS Memory Manager Present: NO
EMS Memory Size 0 KBytes
Conventional Memory Size 640 KBytes
Extended Memory Size 0 KBytes
User Interface Version v1.0q
Mewel Library Version v3.4
Adapter Diagnostic Tests Version v1.0g
Operating System Version v7.0

NIC Configuration and Product Information:
------------------------------------------

Device number: 12
Bus number: 0
I/O port address: F800h to F83Fh
Interrupt request level: 9
Media type: Fiber cable
SRAM size: 128 K Bytes
EEPROM size: 2 K Bytes
Network speed: 155 M Bit/s
Product revision: 0
Date of manufacture: 8/14/96
First of 16 sequential MAC address:
00 A0 24 B1 A2 E0

Diagnostic Test Results:
------------------------

Internal Tests Results

Register Access Test:  Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0

EEPROM Access Test : Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0

SRAM Address Test :  Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0
```

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```
SRAM Data Test :  Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0

Internal Loopback Test :  Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0

Interrupt Test :  Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0

External Looopback Test Results

External Loopback Test : Passed
Total Repetitions Completed : 10
Repetitions Passed : 10
Repetitions Failed : 0

Halt On Error : YES
Test Repetitions : 10

NIC Maintained Statistics (if any):
-------------------------------------

Cells transmitted: 3760
Cells received:3760
Cells received with CRC error: 0
Cells received with Congestion Flag: 0
Cells received with Cell Loss Priority Flag: 0
Cells Drop error: 0
Invalid Cells error: 0

Diagnostic tests ended at: 12/09/96, 12:09:52
```

**Figure 6-9** Sample of Diagnostic Test Report File

## What to Do If a Test Fails

If the diagnostic tests fail, the 3C975 ATMLink NIC may not be defective. Follow these steps to test the NIC further.

**CAUTION:** *Make sure to turn the power off and disconnect all cables from the NIC before inserting or removing it from the computer.*

1 **Check the NIC installation by reviewing the installation instructions in Chapter 2.**

Make sure the board is seated correctly in the slot.

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**2 Inspect all cables and connections.**

**3 Make sure that your computer was booted with DOS version 6.x, and that no device drivers or memory managers are loaded.**

**4 Make sure that the PCI slot with the NIC in it is activated.**

Some PCI computers allow PCI slots to be activated or deactivated through the computer's CMOS utility or a special PCI utility. Refer to your computer documentation for information about activating PCI slots.

**5 Make sure that the 3C975 ATMLink NIC is in a bus master slot.**

Some computers do not support bus mastering on all PCI slots. The ATMLink NIC does not work in a non–bus master slot. Refer to your computer documentation.

**6 Try installing the NIC into another PCI slot. The original slot may be defective.**

**7 Replace the failed NIC with a working NIC and run the diagnostic tests again.**

If the working NIC passes all tests, the original NIC is probably defective. For information on returning products for repair, refer to Appendix B, "Technical Support."

**8 Install the NIC in another functioning PCI computer and run the tests again.**

Your computer may be defective. If the NIC passes the tests in the second computer, contact the reseller or manufacturer of the original computer.

**9 Remove all other PCI NICs from the computer and run the tests again. If the tests pass, the other PCI NICs may be causing contention.**

*3Com recommends that you always run the most current version of the system BIOS. Firmware upgrades are often available online from the manufacturer of your computer system.*

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## Constructing Loopback Plugs

To run the external loopback test, you must first insert a loopback plug into the cable connectors of the 3C975 ATMLink NIC. The following instructions describe how to construct a loopback plug for the 3C975-F and the 3C975-UTP ATMLink NICs.

### Fiber-Optic Loopback Plug

The loopback plug lets the ATMLink NIC to transmit and receive on a closed loop. A fiber-optic loopback plug for the 3C975-F NIC may be constructed from a single strand or a double strand of standard fiber-optic cable.

To construct a loopback plug from a single strand of fiber-optic cable, insert the male connectors at both ends of the cable into the female connectors on the NIC.

To construct a loopback plug from a double-strand fiber-optic cable, uncouple the connectors at both ends of the cable, and insert the two male connectors of one of the strands into the connector ports on the NIC. A double-strand fiber-optic cable has writing on one of the strands in the pair, but not on the other.

The following procedure for creating a loopback plug from a common type of double-strand cable is provided for your reference. The way the connectors clip together may vary with the manufacturer.

1. **Unclip the connectors at both ends of the double-strand cable, as shown in Figure 6-10.**
2. **Clip together the connectors of one of the strands (one strand has markings on it, the other does not), as shown in Figure 6-11.**
3. **Insert the connectors into the SC connector ports of the 3C975-F ATMLink NIC.**

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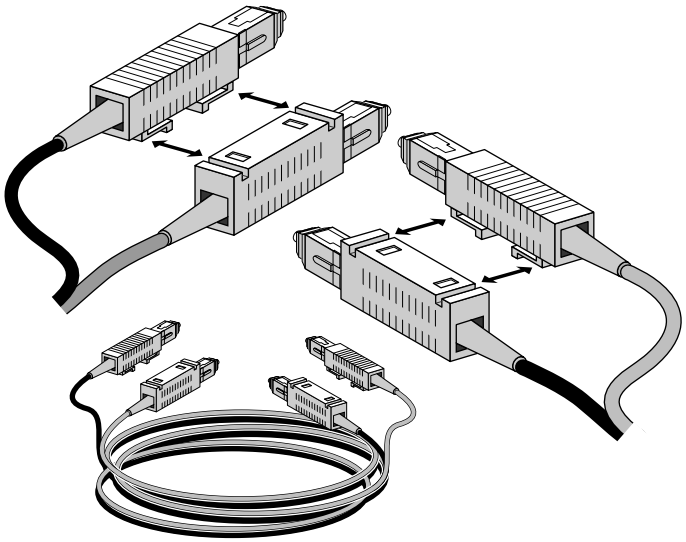

**Figure 6-10** Unclipping the Connectors of a Double-Strand Fiber-Optic Cable

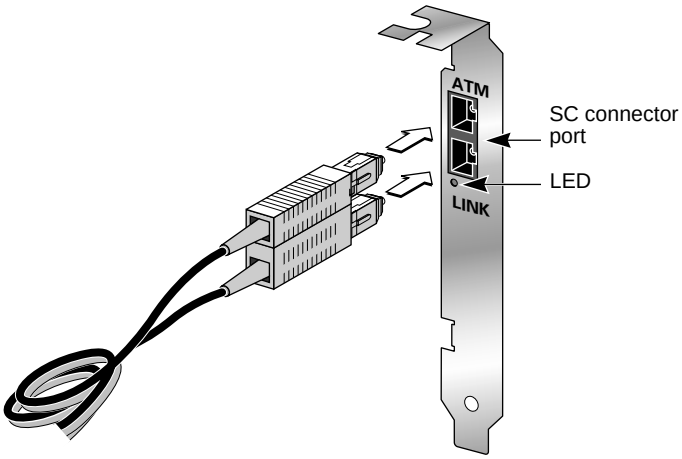


**Figure 6-11** Clipping Together the Ends of the Same Fiber Strand

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## RJ-45 Loopback Plug

To construct an external loopback plug for use in testing the unshielded twisted-pair version of the ATMLink PCI NIC (3C975-UTP), use an RJ-45 unshielded male connector. Wire the loopback plug so that the transmit output of the NIC (connector pins 1 and 2) is directly wired to the NIC's receive input (connector pins 7 and 8, respectively), as shown in Figure 6-12. See Appendix A for a complete table of pinouts for the 3C975-UTP NIC.

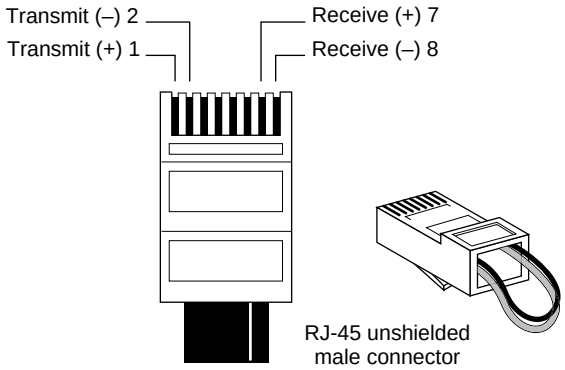


**Figure 6-12** UTP External Loopback Plug

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## Link LED

The state of the Link LED indicates the ATMLink NIC operating status. Table 6-3 explains the possible LED states.

**Table 6-3** LED Activity

| LED State | Explanation |
|---|---|
| Slow blinking | ■ The operating system is loading the drivers and activating the NIC.<br>■ A diagnostic test is being run. |
| Lit | A good link is established with the ATM switch. |
| Off | ■ A link with the ATM switch has not been established.<br>■ The NIC is a standby NIC.<br>■ The driver is not loaded. |

*The LED of a standby NIC does not light unless the NIC changes to active status.*

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# SPECIFICATIONS

## Hardware

| | |
|---|---|
| Memory | 16 Kb serial EEPROM |
| | 128 KB SRAM |
| | 315 Cells on chip buffer |
| Bus interface | PCI Local Bus Specification, Revision 2.0 |
| | PCI Compliance Checklist |
| | 32-bit zero wait state master |
| | 32-bit bus |
| PCI master | Supports up to 13 dword bursts |
| | Supports bus master scatter-gather DMAs |
| | Memory read line support |
| | Memory read multiple support |
| PCI slave | I/O, memory, and configuration cycles |
| Interrupts | Interrupt pin: INTA# |
| LED | Lit when there is an active link to the ATM switch. |
| Board dimensions | Single slot, half-size, 32-bit PCI card |
| | Length: 6.15 in. (15.62 cm) |
| | Width: 4.20 in. (10.67 cm) |
| Power requirements | 10 W (1.5 A @ 5 V, .02 A @ 12V) |

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## Network Connections

| | |
|---|---|
| SC duplex | Multimode fiber (62.5/125 µm)<br>Maximum cable length: 2 km |
| RJ-45 | Category 5 UTP cable 100 m<br>Maximum cable length: 100 m |

## Standards Compliance

| | |
|---|---|
| ATM layer | ANSI T1S1/92-002R3, ITU 1.361,<br>ATM Forum UNI v.3.1 specification |
| ATM adaptation layer | AAL5, AAL 3/4, AAL 0 |
| LAN emulation | LANE 1.0 |
| ATM signaling | UNI 3.0/3.1 |

## Environment

| | |
|---|---|
| Operating temperature | 0 to 60 ˚C |
| Storage temperature | –40 to 70 ˚C |
| Operating relative humidity | 10% to 95% (noncondensing) |
| Storage humidity | 5% to 95% (noncondensing) |

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## RJ-45 Connector Pinouts

Table A-1 lists the pin assignments for the RJ-45 connector.

**Table A-1** RJ-45 Connector Pinouts

| Pin Number | ATMLink NIC | ATM Switch |
|---|---|---|
| 1 | Transmit + | Receive + |
| 2 | Transmit – | Receive – |
| 3 | Not used | Not used |
| 4 | Not used | Not used |
| 5 | Not used | Not used |
| 6 | Not used | Not used |
| 7 | Receive + | Transmit + |
| 8 | Receive – | Transmit – |

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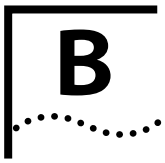

# TECHNICAL SUPPORT

3Com provides easy access to technical support information through the variety of services described in this appendix.

## Online Technical Services

3Com offers worldwide product support 24 hours a day, 7 days a week, through the following online systems:

- 3Com Bulletin Board Service (3ComBBS)
- World Wide Web site
- 3ComForum on CompuServe®
- 3ComFacts℠ automated fax service

### 3Com Bulletin Board Service

3ComBBS contains patches, software, and drivers for all 3Com products, as well as technical articles. This service is available via modem or ISDN, 24 hours a day, 7 days a week.

#### Access by Analog Modem

To reach the service by modem, set your modem to 8 data bits, no parity, and 1 stop bit.

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Call the telephone number nearest you:

| Country | Data Rate | Telephone Number |
|---|---|---|
| Australia | up to 14400 bps | (61) (2) 9955 2073 |
| Brazil | up to 14400 bps | (55) (11) 547 9666 |
| France | up to 14400 bps | (33) (1) 69 86 69 54 |
| Germany | up to 28800 bps | (49) (89) 627 32 188 |
| Hong Kong | up to 14400 bps | (852) 2537 5608 |
| Italy (fee required) | up to 14400 bps | (39) (2) 273 00680 |
| Japan | up to 14400 bps | (81) (3) 3345 7266 |
| Mexico | up to 28800 bps | (52) (5) 520 7835 |
| P. R. of China | up to 14400 bps | (86) (10) 684 92351 |
| Singapore | up to 14400 bps | (65) 534 5693 |
| Taiwan | up to 14400 bps | (886) (2) 377 5840 |
| U.K. | up to 28800 bps | (44) (1442) 278278 |
| U.S.A. | up to 28800 bps | (1) (408) 980 8204 |

### Access by Digital Modem

ISDN users can dial-in to 3ComBBS using a digital modem for fast access up to 56 Kbps. To access 3ComBBS using ISDN, use the following number:

**(408) 654 2703**

## World Wide Web Site

Access the latest networking information on 3Com Corporation's World Wide Web site by entering our URL into your Internet browser:

**`http://www.3Com.com/`**

This service features news and information about 3Com products, customer service and support, 3Com Corporation's latest news releases, selected articles from 3TECH™ (3Com Corporation's award-winning technical journal) and more.

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## 3ComForum on CompuServe

3ComForum is a CompuServe-based service containing patches, software, drivers, and technical articles about all 3Com products, as well as a messaging section for peer support. To use 3ComForum, you need a CompuServe account.

To use 3ComForum:

1. **Log on to CompuServe.**
2. **Enter `go threecom`.**
3. **Press [Return] to see the 3ComForum main menu.**

## 3ComFacts Automated Fax Service

3Com Corporation's interactive fax service, 3ComFacts, provides data sheets, technical articles, diagrams, and troubleshooting instructions on 3Com products 24 hours a day, 7 days a week.

Call 3ComFacts using your touch-tone telephone. International access numbers are:

| Country | Telephone Number |
|---|---|
| U.K. | (44) (1442) 278279 |
| U.S.A. | (1) (408) 727 7021 |

Local numbers are available within the following countries:

| Country | Telephone Number |
|---|---|
| Australia | 800 123853 |
| Belgium | 0800 71279 |
| Denmark | 800 17319 |
| Finland | 98 001 4444 |
| France | 05 90 81 58 |
| Germany | 0130 8180 63 |
| Italy | 1678 99085 |

| Country | Telephone Number |
|---|---|
| Netherlands | 06 0228049 |
| Norway | 800 11062 |
| Portugal | 0505 442607 |
| Russia (Moscow only) | 956 0815 |
| Spain | 900 964445 |
| Sweden | 020 792954 |
| U.K. | 0800 626403 |

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## Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Diagnostic error messages
- A list of system hardware and software, including revision levels
- Details about recent configuration changes, if applicable

If you are outside the U.S.A. and Canada, contact your local 3Com sales office to find your authorized service provider. Use one of these numbers:

| Country | Telephone Number | Country | Telephone Number |
|---|---|---|---|
| Australia* | 1800 678 515 | Japan | (81) (3) 33457251 |
| Belgium* | 0800 71429 | Mexico | (525) 531 0591 |
| Brazil | (55) (11) 546 0869 | Netherlands* | 06 0227788 |
| Canada | (905) 882 9964 | Norway* | 800 11376 |
| Denmark* | 800 17309 | Singapore | (65) 538 9368 |
| Finland* | 0800 113153 | Spain* | 900 983125 |
| France* | 05 917959 | Sweden* | 020 795482 |
| Germany* | 0130 821502 | Taiwan | (886) (2) 577 4352 |
| Hong Kong | (852) 868 9111 | United Arab Emirates | (971) (4) 349049 |
| Ireland* | 1 800 553117 | U.K.* | 0800 966197 |
| Italy* | 1678 79489 | | |
| South Africa | (27) (11) 803 7404 | | |

* These numbers are toll-free.

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## Returning Products for Repair

A product sent directly to 3Com for repair must first be assigned a Return Materials Authorization (RMA) number. Products sent to 3Com without RMA numbers will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

| Country | Telephone Number | Fax Number |
|---|---|---|
| U.S.A. and Canada | (800) 876 3266, option 2 | (408) 764 7120 |
| Europe | 31 30 60 29900, option 5 | (44) (1442) 275822 |
| Outside Europe, U.S.A., and Canada | (1) (408) 492 1790 | (1) (408) 764 7290 |

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# Glossary

**AAL**

ATM Adaptation Layer. Translates packets of data to 53-byte cells for transmission on the network. The layers are defined to provide different classes of service for ATM connections, and to provide a method of mapping data from a particular class of service into ATM cells in such a way that the data can be remapped into its original format at the other end of an ATM network.

**ATM**

Asynchronous Transfer Mode. Also called "cell relay." A switched, connection-oriented technology for local area networks (LANs) and wide area networks (WANs). ATM accommodates a mix of data types such as audio, video, and data on a single network.

**ATM Forum**

An industry organization with over 300 members that is working to define ATM networking protocols. The group is defining and tailoring existing specifications to make ATM LANs a reality.

**ATM LAN**

Topology that consists of ATM switches and computer interfaces that provide high data rate connectivity for voice, video, and data (IP, SNA, and multimedia).

**BUS**

Broadcast and Unknown Server. A server within LAN emulation (for ATM networks) that has the ability to receive broadcast requests from all other stations on the network, and forward them to a multicast switch. The switch, in turn, broadcasts the requests to all other stations on the network.

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**Cell**

The basic data unit used to transmit information through an ATM network. The cell is 53 bytes in length and supports high-speed packet switching techniques.

**End station**

A machine that is connected to a network and is intended to run user application programs. In an ATM network, an ATM connection is terminated or initiated at the end station.

**ELAN**

Emulated LAN. See LANE.

**ILMI**

Interim Local Management Interface. The ATM Forum standard for incorporating network management into ATM networks. ILMI can be used as a monitor for transfers between a router and an ATM switch, reporting CRC error rates and performance dips.

**IP**

Internet Protocol. A network-layer protocol that contains addressing and control information to allow packets to be routed over dissimilar networks.

**KB**

Kilobytes. 1024 bytes.

**LANE**

LAN Emulation. A specification of a software driver that operates below the host Link Level protocol as if it were the MAC layer of an Ethernet interface. The driver provides broadcast/multicast addressing and other LAN-like functions to convince the host network protocols that they are talking to a real Ethernet interface.

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**LEC**

LAN Emulation Client. Typically located in an ATM end station, its task is to maintain address resolution tables and to forward data traffic. Each LEC is associated with a unique ATM address.

**LECS**

LAN Emulation Configuration Server. A server whose main function is to provide configuration information to an LEC (such as the ELAN it belongs to or its LES).

**LES**

LAN Emulation Server. A server that implements the control coordination function for the emulated LAN. Examples of this function are enabling a LEC to join an ELAN, and resolving MAC to ATM addresses.

**LLC**

Logical Link Control. The upper of the two sublayers of the Data Link Layer of the OSI Reference Model that defines the transmission of data between two stations.

**MAC**

Media Access Control. That part of the ISO model that describes how devices share access to a network. Ethernet, token ring, and FDDI are MAC layer specifications.

**Mbps**

Megabits (1024 x 1024 bits) per second.

**MBps**

Megabytes (1024 x 1024 bytes) per second.

**Multicast**

A technique that allows copies of a single packet or cell to be passed to a selected set of end stations.

**Multimode**

A large-core (62.5 micron) optical fiber through which multiple signals will propagate.

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**MIB**

Management Information Base. A definition of management items for some network component that can be accessed by network management software. A MIB includes the names of objects it contains and the type of information retained.

**Node**

A device connected to the network media, usually with an adapter card.

**Point-to-point**

Transmission of data between two nodes on a network where one node is the sender and the other node is the receiver.

**PVC**

Permanent Virtual Circuit. An ATM mode in which the communication circuit between two nodes on a network is manually set up and torn down.

**SAR**

Segmentation and Reassembly. A procedure that breaks down and reassembles variable-length packets from legacy LAN (Ethernet and token ring) applications. The SAR chip set receives protocol data units (PDUs) from the convergence sublayer and divides them into small segments, typically 44 bytes long. Two header bytes and two trailer bytes are added to these segments. The resulting segment is a 48-byte PDU that fits into the payload of an ATM cell.

**SDH**

Synchronous Digital Hierarchy. A European body of standards that defines all aspects of transmitting and managing digital traffic over optical fiber.

**Signaling**

An ATM connection procedure that implements explicit routes through switches to establish a communication link with another station on the network.

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**SONET**

Synchronous Optical Network. A growing body of standards that defines all aspects of transmitting and managing digital traffic over optical (fiber) facilities.

**STS-3c**

Synchronous Transport Signal, Level 3 Concatenated.

**SVC**

Switched Virtual Circuit. Circuit that creates a dynamic connection between two network nodes. SVCs are created "on demand" and are torn down upon completion of the data transfer.

**TCP/IP**

Transmission Control Protocol/Internet Protocol. Network architecture standard for internetworking multiple organizations. The TCP/IP protocol stack is dominant in academic and research sites, and is the standard protocol for the Internet.

**Token ring**

A 4 Mbps or a 16 Mbps network using a ring topology and a token-passing access method.

**VBR**

Variable Bit Rate. The transmission of data bits at varying rates over a network.

**VCI**

Virtual Circuit Identifier. A 2-byte field in an ATM cell header that, when combined with the VPI (Virtual Path Identifier), makes up an ATM address.

**Virtual circuit (virtual channel)**

A "logical transmission path" or connection between two network endpoints.

**Virtual path**

A group of virtual circuits that connect two network devices.

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**VPI**

Virtual Path Identifier. A 1-byte field in an ATM cell header that, when combined with the VCI (Virtual Circuit Identifier), makes up an ATM address.

**Well-known Address**

The default 20-byte ATM address of the LECS in LAN emulation suggested by the ATM Forum, expressed in hexadecimal notation as:
47:00:79:00:00:00:00:00:00:00:00:00:00:00:A0:3E:00:00:01:00

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**LIMITED WARRANTY**

**HARDWARE:** 3Com warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for the following lengths of time from the date of purchase from 3Com or its Authorized Reseller:

| | |
|---|---|
| Internetworking products | One year |
| Network interface cards | Lifetime |
| Ethernet stackable hubs and unmanaged Ethernet fixed port repeaters | Lifetime* (One year if not registered) |
| *Power supply and fans in these stackable hubs and unmanaged repeaters | One year |
| Other hardware products | One year |
| Spare parts and spares kits | 90 days |

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**GOVERNING LAW:** This Limited Warranty shall be governed by the laws of the state of California.

### FCC CLASS A VERIFICATION STATEMENT

***WARNING:*** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, “Digital Apparatus,” ICES-003. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at the user’s own expense.

Changes or modifications not expressly approved by 3Com could void the user’s authority to operate this equipment.

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## FCC CLASS B CERTIFICATION STATEMENT

3Com Corporation
Model No: 3C975-F
FCC ID: DF63C975-F
Made in U.S.A.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1 this device may not cause harmful interference, and

2 this device must accept any interference received, including interference that may cause undesired operation.

***WARNING:*** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, "Digital Apparatus," ICES-003. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from the one which the receiver is connected to.
- Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful:

*The Interference Handbook*

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-00345-4.

***NOTE:*** In order to maintain compliance with the limits of a Class B digital device, 3Com requires that you use quality interface cables when connecting to this device. Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment. Refer to the manual for specifications on cabling types.

## CANADIAN NOTICE

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

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Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

**CAUTION:** *Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.*

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